MULTIMEDIA RESEARCH
33 BROWNS LANE • BELLPORT, NY 11713 • (631) 286-8925

Feasibility and Viability of Science Media Review Concept

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By
Principal Investigator
Barbara N. Flagg, Ed.D.
Director

with assistance of
Alice Bernard
Sandra Crow
Valerie Knight-Williams
Leslie Petty
Debra Slechta
Helen Swartwood-Carley

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EXECUTIVE SUMMARY OF FEASIBILITY AND VIABILITY OF SCIENCE MEDIA REVIEW CONCEPT

Using focus group methodology, exploratory research was carried out to assess the feasibility and viability of presenting to the public an on-going review of new findings or issues in major fields of science research. This study examines
(1) the American public's current habits in receiving science information from media;
(2) the public's awareness of and interest in broad areas of contemporary science research;
(3) the presentation formats and features most likely to appeal to and reach the public.

Sample. A total of 128 adults participated in focus groups with 6-8 members per group in 6 nationally distributed sites. The three focus groups run at each site were stratified by occupational status (34% professional; 35% skilled; 31% semi- or unskilled), with equal gender distribution. Minority ethnic groups contributed 21% to the total sample. Participants ranged in age from 21 to 69 years old, with a mean age of 40.1 years. Less than half of the sample (43%) had a bachelor's degree or higher, and 85% of the sample was employed, with 46% earning over $50,000 in total household income.

Procedure. Focus group participants completed a questionnaire about demographics, regular media use and media that provided them with science content. Subsequently, for 30 minutes, respondents recalled any recent science news stories from any media, discussing content, media source and attractive presentation features. For a second 30 minutes, respondents rated their knowledge of and interest in a written list of ten major contemporary research areas in science and discussed reasons why two of those areas interested them the most. For a final 30 minutes, groups shared ideas about presentation formats and features that they felt would attract their interest and facilitate communication of science updates.

Results

Through what media does the public currently obtain its science news?

What media do the focus group participants use regularly?
- 92% regularly listen to radio;
- 91% regularly watch television;
- 82% regularly accessed the Internet;
- 78% regularly read newspapers; and
- 73% regularly read magazines or journals.

Which of their regularly used media do respondents feel provide them with science content?
- 59% chose television programs (typically commercial news shows);
- 59% used Internet to locate science or medical information. Those with less education and those with semi/unskilled occupations were less likely to look for science or medical information on the Internet.
- 56% picked newspapers (typically the city's primary daily paper);
- 46% indicated magazines or journals (typically weekly news magazines);
- 27% noted radio stations (typically public radio). Those with higher household incomes were significantly more likely to report hearing science content on their favorite radio stations.

Through how many media were respondents exposed to science stories?
- 9% of the sample was exposed to science news through all five media;
- 15% through four media;

- 28% through three;
- 23% through two;
- 15% through one;
- 10% reported zero exposure to science stories in the media.
- Usage of more media formats related significantly to higher household income.

In everyday experience, what kind of science news stories attract the public through which media and why?

Could participants recall a recent science news story from any media?
- 69% of the 128 focus group respondents recounted a story;
- 11% more recognized one of those stories;
- 20% did not recall or recognize a science story.
- 12% could recall and describe a second science news story.
- Those who could recall or recognize a recent science story identified significantly more media as giving them science content than those who could not recall a science story.
- Public radio listeners were more likely to recall a science story, although their stories were not drawn from public radio programming.

From which media did participants recall the science news stories?
- 49% of the stories originated in a TV broadcast, with half from commercial news.
- Remaining stories were almost equally split among the four other media.
- Most stories told by skilled and semi/unskilled workers were from obtained from television, whereas professionals drew their stories more equally from all five media.

What kind of science news stories attracted the participants?
- 35% of science news stories recounted involved health or medicine;
- 15% concerned space sciences or the universe;
- 11% focused on issues of the immune system;
- The remaining stories were spread among nine other content categories.
- Story category recalled was related to gender. Only men recalled stories in the categories of nature, information technology and neuroscience, whereas women told 69% of the health/medicine stories.

What were the most attractive qualities of the stories recounted?
- 39% Personal relevance (more women used this descriptor);
- 35% Informative;
- 28% Visuals;
- 22% Interesting topic.

What broad areas of contemporary research content have the most potential for attracting the public?

Group participants responded to a written list of ten major contemporary research areas in science with some of the major defining questions in each area. The list represented important issues in contemporary science that might be the basis for review programs.

How did participants rate their knowledge of ten contemporary research areas in science?

- An overall mean rating of 2.0 out of 5 (5 = "very knowledgeable") indicates that respondents felt somewhat uninformed about contemporary science.
- 54% of the sample gave lowest knowledge ratings of "1" or "2" to all ten topics.
- Six topics received a mean rating of 2.0 or above: the immune system; human impact on Earth; the universe; life on Earth; Earth and its atmosphere; and neuroscience.
- Those respondents with higher educational levels rated their knowledge higher in the areas of immune system and neuroscience.
- Men rated their knowledge higher than women in the categories of information technology, materials science and fundamental physics.

How did participants rate their interest in the ten science research areas?

- An overall mean rating of 3.5 out of 5 (5 = "very interested") indicates that respondents felt somewhat interested in contemporary science issues.
- 25% of the sample gave highest interest ratings of "4" or "5" to all ten topics.
- Six topics received a mean rating of 3.5 or above: the immune system; human impact on Earth; neuroscience; the universe; genetic technology; and Earth and its atmosphere.
- Women rated their interest significantly higher than men in the categories of immune system and neuroscience, whereas men rated their interest higher in information technology and fundamental physics.

Which of the ten research areas interested participants the most?

- Gender was a significant variable in respondents' choices of two topics that interested them the most.
- The top five topics for women accounted for 95% of their votes and focused on human issues: immune system, neuroscience, human impact on Earth, genetic technology and universe.
- The men were broader as well as different in their choices of favorite categories, with 67% of their votes going for five choices: human impact on Earth, universe, information technology, Earth and its atmosphere, and immune system.
- More women than men preferred the immune system and neuroscience topics, whereas more men than women preferred the topics of Earth and its atmosphere, information technology and materials science.

Why do the ten broad areas of contemporary research attract the public?

Group participants described why they chose their two "most interesting" research areas among the ten described in the list:

- The major theme across the areas was how relevant the topic was to one's own life - relevance to one's health and functioning; to understanding oneself; to protecting one's environment; to one's work, hobby, or childhood interest; or to simply being human.
- An intellectual interest was a secondary trend across the topics - respondents were "fascinated" or just "interested" in the topics and the associated research questions.

What main reasons explain appeal of individual research areas?

- Immune system - direct personal interest, often because of medical fears about oneself or a family member or fears associated with aging;

- Neuroscience - intellectual "fascination" or "interest";
- Human impact on Earth - concern with saving Earth for future generations or had experienced some local negative environmental impact;
- Universe - fascination with the "big" questions or interest traced back to childhood;
- Genetic technology - intellectual "fascination;" feeling that research would lead to cures; or interest in ethical issues raised;
- Life on Earth - interest in content issues including the origins of life and evolution as well as the histories of societies and languages;
- Earth and its atmosphere - interest in the dynamics and impact of weather;
- Information technology - concern with changes in their lives and others because of technological advances and increased speed of communication and information transfer;
- Materials science - interesting to those whose work involved materials;
- Fundamental physics - interesting to those seeking the "ultimate science."

What formats and features presenting up-to-date findings within broad science areas have the potential to capture the eyes and ears of the public on a regular basis?

Respondent groups brainstormed ways to reach them most successfully:

- Make science presentations more readily available to accommodate busy schedules:
  - Short radio/TV/magazine news "blurbs" or "commercials" are easier to catch. Can go to Internet, newspaper for in-depth information;
  - Daily science news reports integrated into local and national news programs;
  - Schedule longer format television and radio at convenient times;
  - To permit self-scheduling, provide video rentals or free library videos;
  - Increase overall amount of programming available;
  - Establish a dedicated science channel;
  - Establish "science" as a main category button in server home pages (e.g., AOL, MSN);
  - Provide Internet links within radio/TV/print stories for in-depth follow-up.
- Present in all media at a level that the public can understand;
- Use visuals in all media to attract and aid understanding;
- Make the science relevant and personal to their lives:
- Reach them though their children by getting kids interested in science early and presenting in ways that encourage parents to interact with their kids.
- Continue or add a science supplement to newspapers;
- Take care in choosing a host and defining that role;
- Market widely, creatively and often:
  - Cross-media advertising: have ads for public television in the cable television market; ads for public radio in the television market, and so forth.
  - Promote the NSF "brand."
  - Advertising by names to attract: Bill Nye; Oprah.
  - Billboards along a regular commuting route.
  - Airplane banners over beaches, football games to reach large and diverse groups.
  - Internet banners but not e-mail spam notification, unless someone has indicated an interest in a specific topic, as in signing up for specific subjects.
  - Set up Internet source to identify past, present and future media programs on topics;
  - Establish a consistent science time and advertise the time and subjects.
- Establish credibility;
- Think outside the box.

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INTRODUCTION

Currently, the science media programs sponsored by the National Science Foundation's Informal Science Education Program fall into two main categories: those that cover a basic science topic in some depth (for example, *NOVA*) and those that present breaking news of an individual research project (for example, *Science Friday* or NSF's own website). A third and important category of science coverage that is missing in ISE's lineup are timely reviews of contemporary research within major fields. Such reviews would permit the public to keep abreast of major happenings in a specific field like the recent wide-ranging discoveries in genome research or global climate research. Such reviews would not teach basic background science nor present specific new findings piecemeal but would reach and educate a diverse public with media updates, grouping current research news within the context of a broad field of science endeavor. This report is the first of two that explores the feasibility and viability of this communication concept.

The research objectives and research questions of this study focused on three broad areas: media, science content and presentation formats:
- to obtain information on the American public's science media habits to assess the relative value of **media** venues for a science update concept:
- Through what media does the public currently obtain its science news?
- to evaluate the public's awareness of and interest in broad areas of research **content** (e.g., global climate; human genome) to suggest attractive stories for presentation:
- In everyday experience, what kind of science news stories attract the public through which media and why?
- What broad areas of contemporary research content have the most potential for attracting the public and why?
- to explore with the public what presentation **formats** would be most appealing and effective in reaching them on a regular basis with up-to-date findings within different science fields:
- What formats presenting up-to-date findings within broad science arenas have the potential to capture the eyes and ears of the public on a regular basis?

The research design is two-pronged: first, a set of national focus groups (reported on in this document) to establish the diversity and depth of audience media habits, content interests and format receptivity; second, based on the focus group findings, a mail survey to build a nationally generalizable database about the research objectives.

METHOD

Sample

A total of 128 adults participated in focus groups with 6-8 members per group in 6 sites: Miami, FL; Philadelphia, PA; Long Island, NY; Boston, MA; Minneapolis, MN; Portland, OR. Scientists were purposely not recruited. Demographics are presented in Table 1 below. The three groups run at each site were stratified by occupational status (34% professional; 35% skilled; 31% semi- or unskilled), with equal male and female respondents (52% female; 48% male). Minority ethnic groups contributed 21% to the total sample (12% Hispanic; 8% Black; 1% Asian), with approximately equal representation within each occupational status category (Professional minority = 19%; Skilled minority = 20%; Semi/Unskilled minority = 25%).

Participants ranged in age from 21 to 69 years old, with a mean age of 40.1 years. Less than half of the sample (43%) had a bachelor's degree or higher, and 85% of the sample was employed, with 46% earning over $50,000 in total household income.

Compared to national statistics[1], our sample distribution is more educated but nationally representative in terms of gender, ethnicity, occupational status and total household income.

Table 1. Sample demographics

Gender	%	**Ethnicity**	%
Female	52	White	79
Male	48	Hispanic/Latino/Chicano	12
		African-American/Black	8
		Asian-American	1
Education	%	**Employment**	%
HS or less	17	Employed	85
Some or two-yr. college	40	Homemaker	9
Four-yr. college	20	Retired	5
Graduate, professional	23	Full-time student	1
Occupational Status	%	**Total Household Income**	%
Professional	34	≤ $30,000	21
Skilled	35	$30,001 - $50,000	33
Semi/Unskilled	31	≥ $50,000	46

Procedure

[1] Census 1990 reports 51% female; 20.3% attained bachelor's degree or higher; 30% hold professional occupations. Census 2000 reports are not yet available for the US as a whole for these categories. For this sample, "not Hispanic or Latino origin" is 88% and for Census 2000 is 87.5%. Racial origin as defined in the Census was not asked for in the demographic questions. Some 40% of US households earn over $49,016 (*NYTimes*, Oct. 26, 2000, p.5).

Respondents met in groups of 6-8 people, stratified by occupational status, with an equal mix of males and females. Upon arrival, a 10 minute questionnaire was completed asking about demographics and general media use. The group moderator then introduced the project to the whole group as follows:

> Good evening/day. My name is …. I work with a consulting group called Multimedia Research. We have been asked by the National Science Foundation to invite you here today to discuss your media habits and more specifically, to explore how you think science news might be presented to you in an attractive and effective way. Hearing your experiences and opinions is important to us.

The moderator then reviewed typical operations of a focus group; that is, tape recording; confidentiality of information; and guidelines for participation in discussion. The three major study topics of media issues, content issues and format issues were discussed via open-ended and probe questions as well as with written survey questions. Upon completion of the two hour session, each participant received an honorarium of $50. [Detailed procedures and questions are provided at the beginning of each of this report's results sections.]

Data Analysis

Qualitative data were analyzed by key-word and key-phrases, focused toward describing repeating patterns and themes. All quantitative and qualitative responses were assessed for statistical relationships with the following variables: age; education; gender; household income; and occupational status (professional, skilled, semi-unskilled). Statistical analyses included, as appropriate, chi-square, *t*-test and regression analysis. Statistics appear in footnotes. Note that in some cases where participants could list more than one response the percentages in charts or tables may add up to more than 100%. Where possible, the statistics of this study's sample are compared with statistics of large national surveys to assess the sample's representativeness. These comparisons appear in footnotes.

Report Organization

Part I of this report (pages 4-16) examines the variety of media that the focus group participants regularly use and more specifically describes how participants are exposed to science news within those regularly used media.

Part II focuses on science content from several angles. Part IIA (pages 17-23) analyzes recent science news stories recalled by participants, looking at the science content, attractive reporting qualities and media sources. Part IIB (pages 24-32) reports quantitative information on respondents' self-assessed knowledge of and interest in ten contemporary research areas and how gender relates to topic preference. Part IIC (pages 33-41) explores qualitative findings about why participants are interested in the ten varied research areas.

Part III (pages 42-47) summarizes presentation formats and features that respondent groups feel will attract their interest and facilitate communication of science updates.

PART I: MEDIA HABITS

Part I of this report examines the variety of media that the focus group participants regularly use and more specifically describes how participants are exposed to science news within their regularly used media.

Through what media does the public currently obtain its science news?

What media do the focus group participants (N=128) use regularly?

- 92% regularly listen to radio;
- 91% regularly watch television;
- 82% regularly accessed the Internet;
- 78% regularly read newspapers; and
- 73% regularly read magazines or journals.

Which of their specific regularly used media did respondents feel provide them with science content?

- 59% chose television programs (typically commercial news shows);
- 59% used Internet to locate science or medical information. Those with less education and those with semi/unskilled occupations were less likely to look for science or medical information on the Internet.
- 56% picked newspapers (typically the city's primary daily paper);
- 46% chose magazines or journals (typically weekly news magazines);
- 27% noted radio stations (typically public radio). Those with higher household incomes were significantly more likely to report hearing science content on their favorite radio stations.

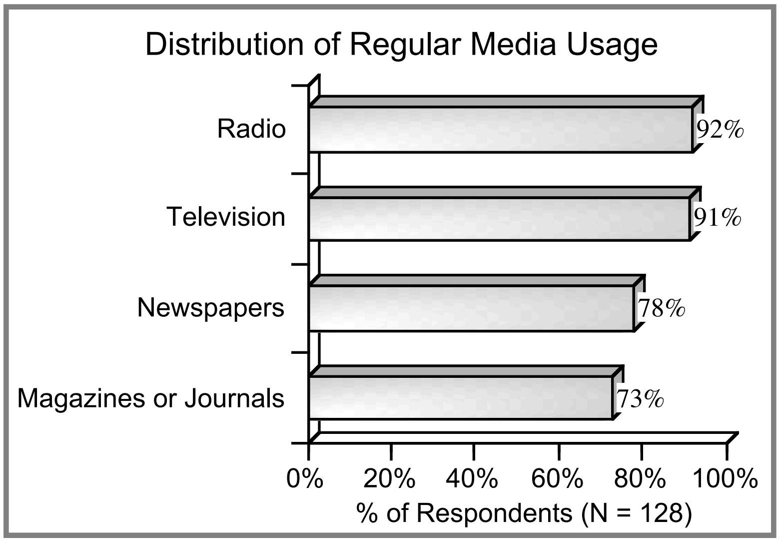
Only 10% of the sample reported no exposure to science news through their regular media usage, whereas 9% reported exposure to science through all five media (TV, Internet, newspapers, magazines, radio). The largest portion of the sample (28%) noted three different media formats as their sources of science information. Usage of more media formats related significantly to higher household income.

Media Regularly Used

Procedure. Upon arrival to the focus group, each participant answered a page of demographic questions and a second page that asked what kind of media they used regularly. The term "regularly" was defined for respondents as "you read a magazine or newspaper at least half the time it is distributed or watch a TV show and listen to a radio show at least half the time it airs."

Media users were asked to specify up to three names each of radio stations, TV shows, newspapers or magazines/journals that they used "regularly." Respondents were asked also to identify in which of the titles they listed they typically read, see or hear about something related to science. For example, within the magazine/journal category, a respondent who listed "TV Guide," "TIME," and "Sports Illustrated" might check that he read science articles in "TIME" but not in the other magazines, either because the magazines did not have such articles or they were not of interest to the respondent. Science was defined very broadly as any science news, including health and medicine, science ethics, public policy, technology as well as the standard science areas. The sections that follow describe participants' responses for each medium.

As indicated in the chart below, almost all respondents regularly used radio (92%) and TV (91%) with about three-quarters reporting regular use of newspapers (78%) and magazines or journals (73%).



Radio

Of the total sample (N = 128), 92% (n = 118) listened regularly to radio.

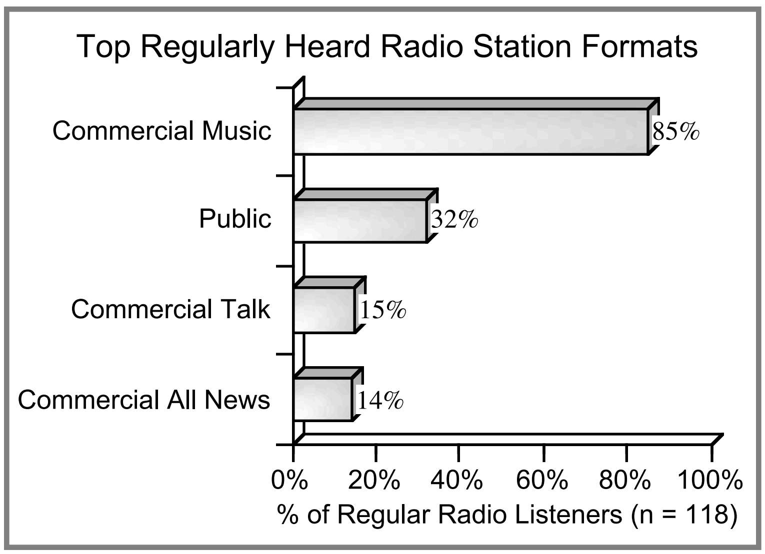
What did the regular users of radio listen to?

- 85% listened to commercial music stations;
- 32% listened to public radio stations;
- 15% listened to commercial talk radio stations; and
- 14% listened to commercial all news radio stations.
- "All Things Considered" or "NPR news" were noted most often as specific programs regularly tuned into by 15% of the radio-using sample.

Did regular radio listeners report hearing science-related content?

- 29% of regular radio listeners noted that they heard science content on their favorite stations, and most of these stations were public.
- Those with higher household incomes were more likely to report hearing science content on their favorite stations.

Of the total sample, 92% (n = 118) listened regularly to radio. The chart below presents the four types of radio station formats that these listeners tuned into most frequently.[2]



Most respondents (85%) listed a commercial music station among their top stations. All varieties of music were covered from classical and country to soft and hard rock.

About one-third (32%) of regular radio listeners mentioned a public station. This usage pattern is higher than the 11% estimated listeners among the general adult population.[3]

Listing a public station was significantly more common among better educated respondents,[4] which closely reflects national statistics in public radio listening. Half of the public radio listeners were professionals (52%), 37% were skilled workers and 11% had semi- or unskilled jobs.[5]

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[2] Respondents could list more than one example of a media thus chart percentages may total over 100.

[3] The number of weekly listeners to public radio in 1996 was almost 20 million (www.cpb.org), which would be about 11% of the 1990 census estimate of American adults (www.census.gov).

[4] Chi-square = 11.09 with 3 df, p = 0.0112. Available statistics estimate from 32% to 57% of the public radio audience graduated college (Simmons, 1993; CPB Roper Starch, 1995). *Audience 98* concludes that "education is the primary determinant of public radio listening" (p.40).

[5] Chi-square = 12.57 with 2 df, p = 0.0019.

A smaller portion (15%) of the radio respondents listened regularly to commercial talk radio stations, with significantly more males than females listing this format, which reflects national statistics.[6] Finally, 14% listed commercial all news radio stations as among those most regularly listened to, particularly Philadelphia's kyw1060 and Detroit's wwj950.

Radio listeners were also asked if there were particular radio programs that they regularly tune into. "All Things Considered" or "NPR news" was listed by 15% of the regular radio listeners, which again reflects national statistics.[7] Two respondents each (2%) also mentioned specifically "Science Friday," "Car Talk," "Marketplace," "Howard Stern," and "Dr. Laura."

Respondents identified on which of their favorite radio stations they heard science-related content: 29% of the 118 regular radio listeners checked off stations. Thus, of the total sample of 128 focus group participants, 27% felt they were exposed to science via radio.

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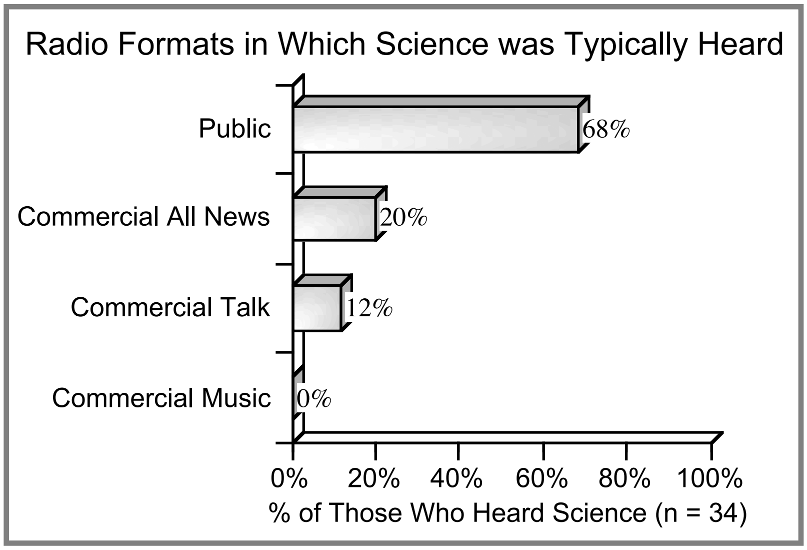
[6] Fisher Exact test = 0.0089. Analyzing 13 polls taken from 1993-1996, University of Michigan researchers found a consistent 17%-18% of people claimed to listen to talk radio, with more men than women in that audience (www.tvrundown.com/views/talkradl.html). Of our total sample of 128, 14% listened to talk radio, with more men listening.

[7] In a report of the Pew Research Center, Spring, 2000, telephone interviews of 3,142 adults reported that 15% "listened regularly to National Public Radio (NPR)" (www.people-press.org/content.htm). Of our total sample of 128, 14% wrote that they listened regularly to "NPR news" or "All Things Considered."

As the chart below shows, most who heard science content listened to public radio stations. Household income best predicted who listened to stations with science-related content; those with incomes higher than $30,000 were more likely to report being exposed to stations with science content.[8]



Television

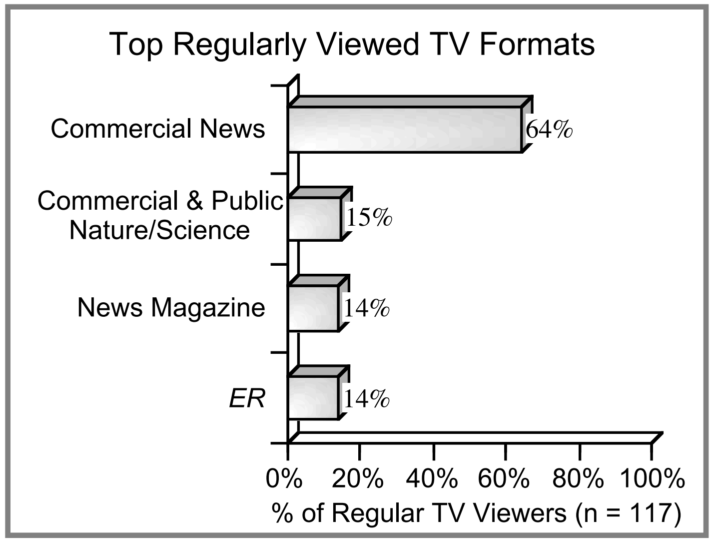
Of the total sample (N = 128), 91% (n = 117) regularly watched television.

What did the regular viewers of television watch?
- 64% viewed local or national televised news;
- 14% watched news magazine programs;
- 15% viewed nature or science shows on commercial and public stations.

Did regular TV viewers report seeing science-related content?
- 65% of TV viewers reported seeing science-related content on their regularly viewed programs or channels, most often on the commercial news programs.

[8] The categorical variable of household income accounted for a significant 7.3% of variance in hearing or not hearing science-related content on radio, R square = 7.3%, $p = 0.0040$.

Of the total sample, 91% (n = 117) regularly watched TV programs. The chart presents the television formats viewed regularly by more than 10% of the viewing subsample. Two-thirds (64%) watched regularly some form of daily commercial news program, either local or national.[9]

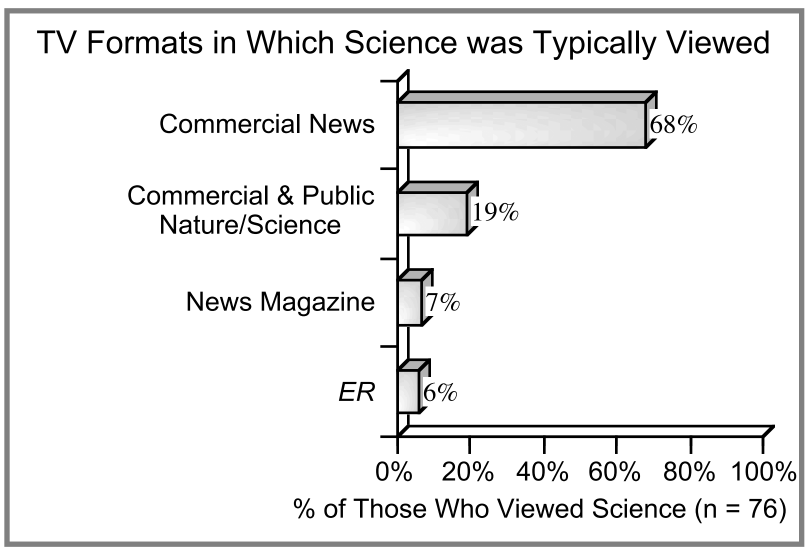


Additionally, 15% of the regular TV viewers listed nature or science programming like *National Geographic* or *Nova* on public stations and commercial stations (e.g., Discovery, The Learning Channel, Animal Planet).

Another 14% listed weekly commercial news magazine shows like *60 Minutes, Dateline* and *20/20.* The news magazine shows were significantly less likely to be viewed regularly by semi/unskilled workers as compared with higher occupational groups.[10]

Finally, 14% admitted to watching *ER* regularly, which might be expected since it was the highest rated drama on television. Fewer than 10% listed numerous other entertainment shows and 9% just wrote "public" TV as being regularly viewed.

Respondents were asked to identify on which of their regularly viewed television programs they saw or heard science-related content: 65% of the 117 regular TV viewers checked off programs. Thus, of the total respondent sample of 128, 59% felt they were exposed to science via television.



As the chart to the right indicates, 68% of viewers noted science reporting on their commercial news shows and 19% mentioned science and nature shows like *NOVA* or cable channels that have many science-based programs, like Discovery.

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[9] Of our total sample of 128, 66% reported that they regularly watched TV news or news magazine shows. This percentage is lower than that found by the Pew Research Center's national survey (www.people-press.org/content.htm). Spring, 2000, telephone interviews of 3,142 adults report that 75% "watch any TV news programs regularly" and 55% "watched TV news yesterday."

[10] Chi-square = 6.622 with 2 df, $\underline{p} = 0.0365$.

Newspapers

Of the total sample (N = 128), 78% (n = 100) regularly read a newspaper.

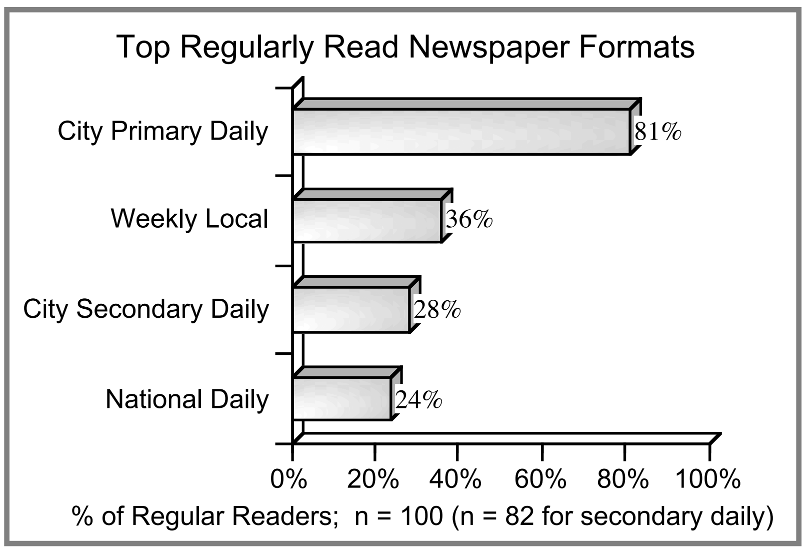
What newspapers did regular readers read?
- 81% read their area's primary daily newspaper;
- 28% read a secondary daily newspaper;
- 36% read a weekly local paper;
- 24% read a national daily.

Did regular newspaper readers report reading science-related content?
- 71% of readers read science-related content in their papers, mostly in the daily city paper.

Of the total sample, 78% (n = 100) stated that they regularly read any newspaper, and 73% reported regularly reading a daily paper, local or national.[11]

The chart to the right indicates that of regular newspaper readers, 81% read their area's primary daily newspaper like the *Boston Globe* . Reading the primary daily newspaper was significantly related to educational level.[12]

Another 36% reported regularly reading a weekly local newspaper like the *Carlisle Weekly*. Women were significantly more likely to read a weekly newspaper than men.[13]



Of those whose areas had access to a secondary daily newspaper (like *The Boston Herald*), 28% reported reading regularly a secondary city newspaper. [14]

[11] The finding that 73% of our sample regularly read a daily paper is somewhat higher than the national statistics: Spring, 2000, telephone interviews of 3,142 adults report that 63% "read any daily newspaper or newspapers regularly" and 46% "read a daily newspaper yesterday" (www.people-press.org/content.htm). This discrepancy is perhaps due to the higher education levels of our participants compared with national levels.

[12] Chi-square = 13.70 with 3 df, $p = 0.0033$.

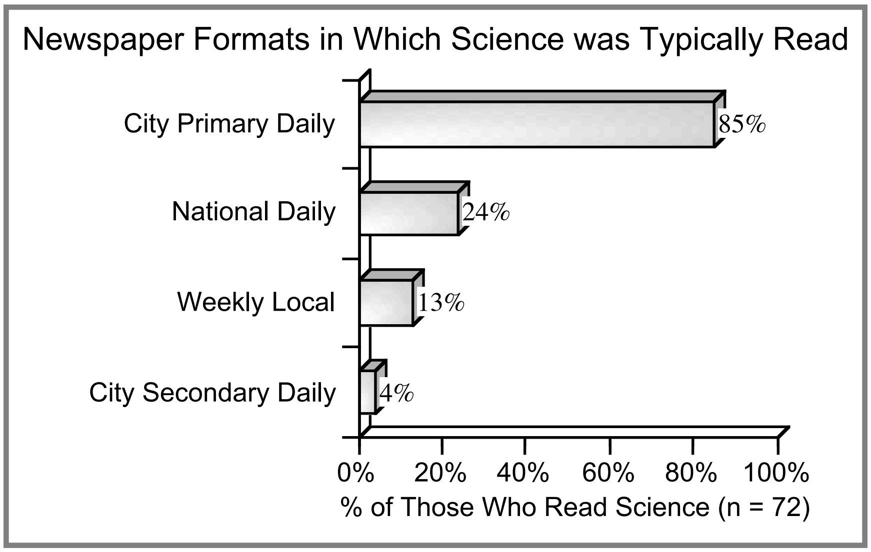
[13] Fisher Exact test = 0.0116.

[14] Portland, OR, does not have a secondary major daily and is not included in the n for this category.

Finally, 24% read a national daily newspaper like *New York Times* or *Wall Street Journal*. Those in the sample who read the national dailies were significantly more likely to be older,[15] more highly educated[16] with a higher household income.[17]

Of the 100 regular newspaper readers, 71% checked off a newspaper choice as one in which they read science-related content (see chart below). Thus, of the total respondent sample of 128, 56% reported exposure to science through newspapers.

As the chart below shows, a large portion (85%) of those who read science do so in their city's primary daily paper; 24% in a national daily, 13% in a local weekly paper and 4% in their city's secondary daily paper.



Magazines or Journals

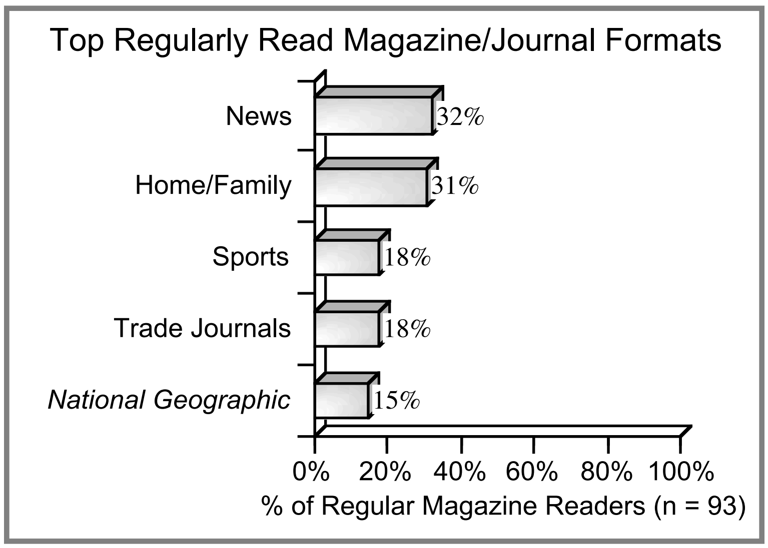
[15] Mean age of readers = 49 years versus mean age of non-readers = 39 years. $\underline{t} = -3.637$, $\underline{p} = 0.0011$.
[16] Chi-square = 10.57 with 3 df, $\underline{p} = 0.0143$.
[17] Chi-square = 7.343 with 2 df, $\underline{p} = 0.0254$.

Of the total sample (N = 128), 73% (n = 93) regularly read magazines or journals.

What magazines or journals did regular users read?
- 32% read weekly News magazines;
- 31% read Home or Family type magazines (more likely women);
- 18% read Sports (more likely men and younger respondents);
- 18% read Trade journals regularly;
- 15% read *National Geographic*.

Did regular magazine readers read science-related content?
- 63% read science-related content, mostly in the weekly News magazines.

Of the total sample, 73% (n = 93) stated that they regularly read magazines or journals.



Of these regular magazine readers, 32% listed News formats like *Time* or *Newsweek* (see chart).[18]

Another third of regular readers listed Home or Family type magazines like *Better Homes and Gardens* or *Family Circle*, with women being significantly more likely to list this category.[19]

Sports magazines like *Sports Illustrated* or *Car & Driver* were regularly read by 18% of the magazine readers; readers of the Sports category tended to be younger[20] and male.[21]

Specific trade journals like *Architectural Record* were listed by 18% of the regular readers. *National Geographic* was specifically named by 15%; this was the largest percentage return for a specific magazine title after *Time* at 20%.

Smaller percentages of regular readers listed various Hobby magazines (13%); Health or Medical magazines (10%); Science or Nature magazines (9%); Business magazines (6%); *People*-type magazines (5%) and *Reader's Digest* (5%).

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[18] Of our total sample of 128, 23% regularly read news magazines compared with 12% found in the Pew Research Center national survey of Spring, 2000 (www.people-press.org/content.htm), although regular reader percentages were equivalent for Business magazines and *People* type magazines. Educational differences in sampling may again relate to preference in our sample for reading material.

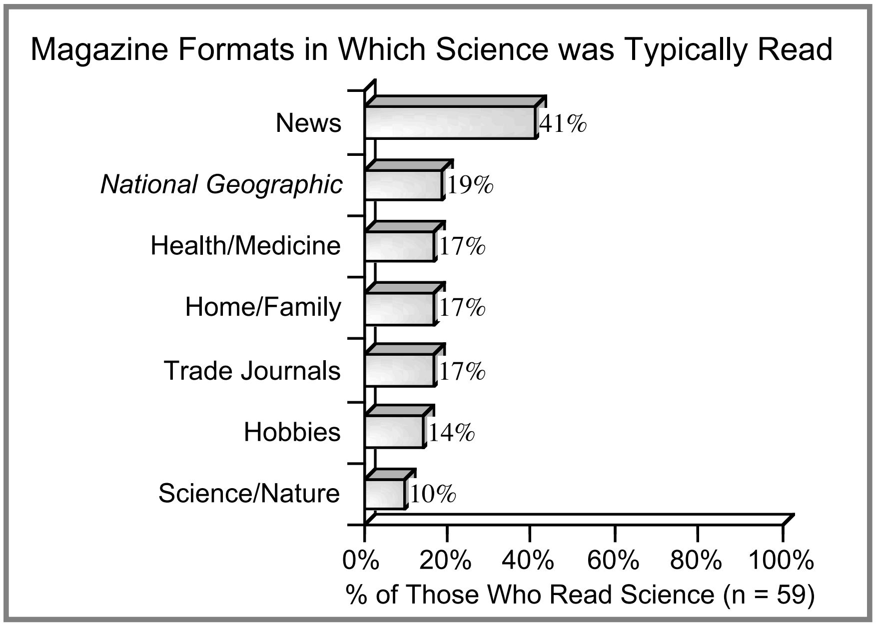
[19] Fisher Exact test = 0.0001.

[20] Mean age of readers = 35 years versus mean age of non-readers = 43 years: $\underline{t} = 2.840$, df = 27, $\underline{p} = 0.0083$.

[21] Fisher Exact test = 0.0073.

Respondents identified which of their list of regularly read magazines or journals presented them with science-related content that they read. Of the 93 regular magazine readers, 63% reported reading science stories. Thus, of the total respondent sample of 128, 46% reported exposure to science through their magazine or journal reading.

The chart below indicates that 41% of those who read science stories did so in the national news magazines like *Time* and *Newsweek* with fewer (19-10%) attending to science in other magazine formats.



Internet

Of the total sample (N = 128), 82% (n = 105) had access to the Internet. Access was significantly related to education.

Of those with Internet access,
- 100% used the Internet for non-work related activities;
- 94% used it to obtain information not related to work;
- 72% used it to locate information in the areas of science or medicine, most often about specific medical conditions.
- Those with less education and those with semi/unskilled jobs were less likely to look for science or medical information on the web.

Of the total sample, 82% (n = 105) had access to the Internet.[22] Having access to the Internet was significantly related to education for our sample; those completing two or more years of college were more likely to report access to the Internet than those with fewer years of education.[23]

Of the respondents with Internet access, 100% reported using the Internet for non-work related activities; 94% used the Internet to obtain information not related to work; and 72% had used the Internet to locate information in the areas of science or medicine.[24] Education and occupational status were related to the latter usage; those with less education and those with semi/unskilled jobs were less likely to look for science or medical information on the net.[25]

Of the 76 respondents who reported accessing the Internet for science or medical information:
- 89% reported looking for information on specific medical conditions, including diabetes (11%) and cancer (8%);
- 14% researched specific medications;
- 13% were interested in astronomy and space issues;
- 13% used the web as a resource for homework;

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[22] The 82% percent of our sample who had Internet access is much higher than the finding of the Pew Internet Project 2000 survey of 12,751 adults, of whom 50% reported Internet access ("Who's Not Online" at www.pewinternet.org). Education differences between samples may relate to difference in access.

[23] Chi-square = 9.512 with 4 df, $p = 0.0495$. Web use has been found positively related to education in large survey studies (e.g., Hoffman, D.L. & Novak, T. P. (1999) The growing digital divide: Implications for an open research agenda. http://ecommerce.vanderbilt.edu/) Cole, J. I. (Oct., 2000) TheUCLA Internet Report: Surveying the Digital Future. www.ccp.ucla.edu and "Who's Not Online" (Sept, 2000) www.pewinternet.org. These surveys also found Internet access to be related to other variables which were not related to access in this study.

[24] Our sample reflects national statistics for using the Internet to obtain medical information. The Pew Internet Project (www.internet.org) found that 55% of 2,277 Internet users (May-June, 2000) and 57% of 2,038 users (Nov.-Dec., 2000) went online to get medical information. In our sample, 57% of 105 Internet users went online for medical information.

[25] Education: Chi-square = 21.99 with 4 df, $p = 0.0002$; Occupation: Chi-square = 15.24 with 2 df, $p = 0.0005$.

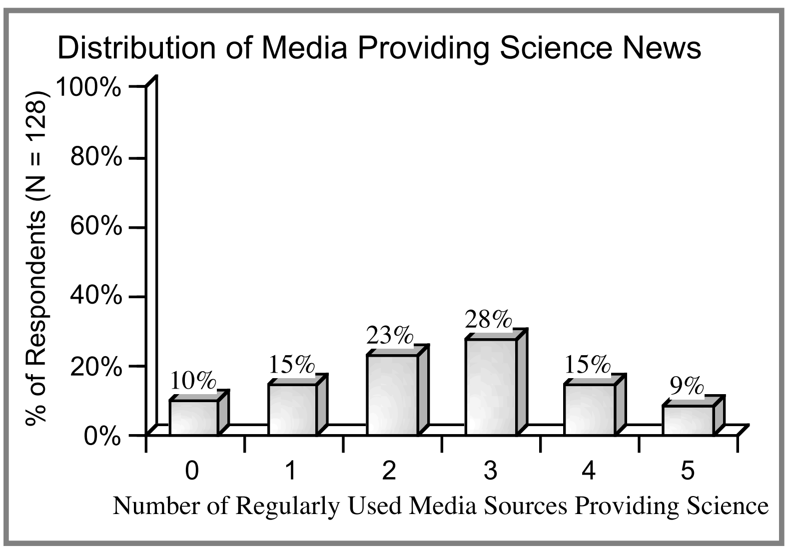
- 8% accessed weather information;
- Other individual science topics included agriculture, anatomy, animals, archaeology, body functions, building technologies, child rearing, computers, dinosaurs, fossils, genetics, holographic storage, motorcycle physics, telecommunications, and ultra-sound.

Frequency of Science Exposure

Through how many media were respondents exposed to science stories?
- 9% of the sample was exposed to science news through all five media;
- 15% through four media;
- 28% through three;
- 23% through two;
- 15% through one;
- 10% reported zero exposure to science stories in the media.

More media sources for science information were reported by those with higher household incomes.

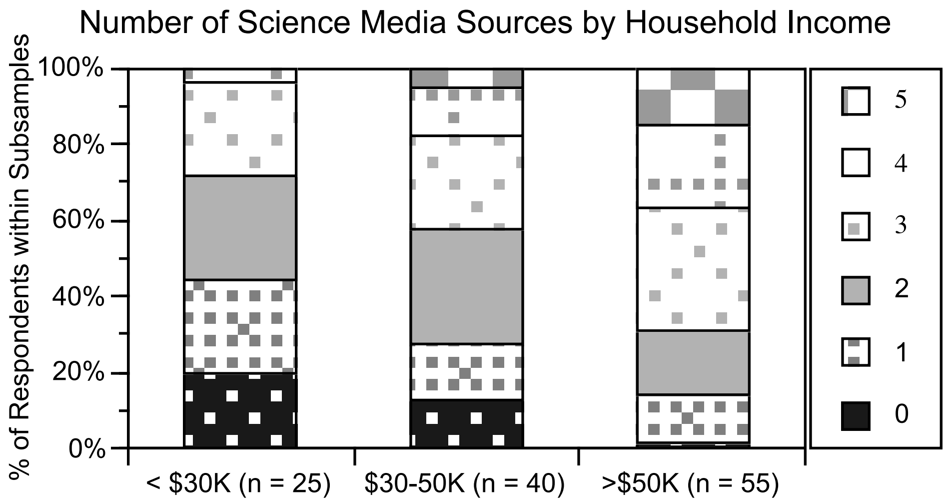
As noted in the previous sections, the focus group participants could report exposure to science stories in five different media: radio, television, newspapers, magazines and the Internet.



The chart to the left indicates a normal distribution of respondents in terms of how many media sources provided them with science information.

Only 10% of the sample reported no exposure to science news through their regular media outlets; whereas 9% reported exposure to science through all five media.

Regression analysis indicates that 14.4% of the variance in the number of media sources providing science is accounted for by household income.[26] The chart below shows how as household income increases more media sources are reported used for science information. No other variables were significantly related to the number of reported media sources for science.



[26] Dependent variable = Frequency of Media; Independent variable = Household Income ($\underline{p}$ = 0.0001): R squared (adjusted) = 14.4%.

PART II: SCIENCE CONTENT

Part II focuses on science content from several angles. Part IIA (below) analyzes recent science news stories recalled by participants, looking at the science content, media sources and attractive story qualities. Part IIB (p. 24) reports quantitative information on respondents' self-assessed knowledge of and interest in ten contemporary research areas and how gender relates to topic preference. Part IIC (p. 33) explores qualitative findings about why participants are interested in the ten varied research areas.

A. In everyday experience, what kind of science news stories attract the public through which media and why?

Could participants recall a recent science news story from any media?
- 69% of the 128 focus group respondents recounted a story;
- 11% more recognized one of those stories;
- 20% did not recall or recognize a science story.
- 12% could recall and describe a second science news story.
- Those who could recall or recognize a recent science story identified significantly more media as providing them with science content than those who could not recall a science story.
- Public radio listeners were more likely to recall a science story, although their stories were not drawn from public radio programming.

From which media did participants recall the science news stories?
- 49% of the stories originated in a television broadcast, with half from commercial local and national news programs.
- Remaining stories were almost equally split among the four other media.
- Most stories told by skilled and semi/unskilled workers were obtained from television, whereas professionals drew their stories more equally from all five media.

What kind of science news stories attracted the participants?
- 35% of science news stories recounted involved health or medicine;
- 15% concerned space sciences or the universe;
- 11% focused on issues of the immune system;
- The remaining stories were spread among nine other categories.
- Story category recalled was related to gender.

What were the most attractive qualities of the stories?
- 39% Personal relevance (more women used this descriptor);
- 35% Informative;
- 28% Visuals;
- 22% Interesting topic.

Awareness of Science in the Media

Procedure. After completing the paper-based questions on demographics and kind of media used regularly (Part I), the participants were asked to recall any science news stories that they had "read about, seen or heard about in recent weeks from any media sources." Respondents were asked to "describe any science news story you have noticed in any media recently." The following probes were used to draw out what the respondents' media experience was:

- What was the general idea of the science news story?
- From what media did you learn about this science news story? Where did you {see/hear/read} about this news?
- Do you recall the {media source's} name?
- What attracted you to {read/watch/listen to} the news story?
- What did you like about the way the news story was presented?
- Has anyone else seen or heard about {story}?

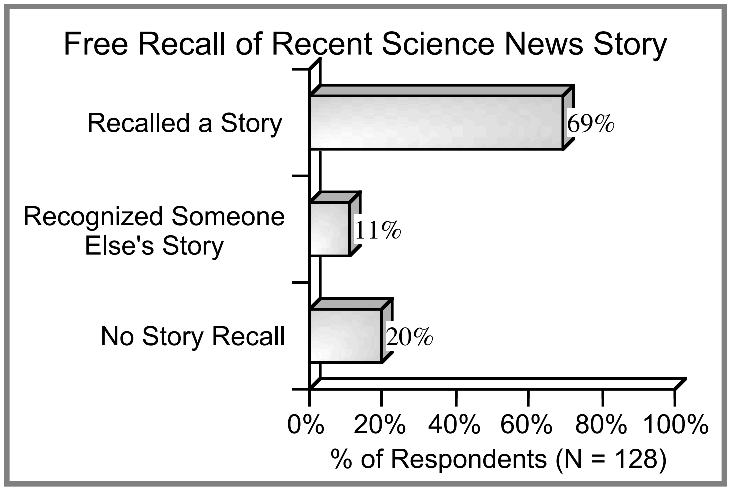
Moderators asked for news stories from as many respondents as would participate up to a 30 minute time limit. If few respondents recalled science news stories, then moderators seeded the discussion with recent news that had been presented in their locale; e.g., "Did anyone recently see/hear about …?" This procedure was needed only in two groups. When no further stories were forthcoming, moderators elicited stories from media that had not been covered; e.g., "Has anyone noticed any science news recently {medium not yet mentioned}?" The goal of these procedures was to elicit from participants as many "top of the mind" science news stories as possible to examine what media and which topics were most salient to the most people.

Below is an example piece of a group discussion of a science story:

> Respondent 1: With my background [tree surgeon], you would know why this caught my eye. That's not the reason. It was just recently discovered that the redwoods out west are probably about a third of the age they guessed.
>
> Moderator: Where did you find that out?
>
> Respondent 1: I believe it was in the [primary daily newspaper] I saw that article. I'm always impressed they tried to guess the age of things in carbon and I question that. So actually the headline caught me, and they were saying something was not as old as they originally guessed. It was trees, they were saying it was the redwoods. They are saying the trees are under 2000 and originally they were saying over 6000. I always look at the carbon when they are trying to figure things out and see a billion years versus a million years. . .I could be wrong, I'm not a scientist. . . but to see they can be so inaccurate with something physical right there in front of them. Heck, we can take a tree's age today in-house. It's not something you want to do to your trees, but we could take a core sample today. For something right in front of them, that they didn't have to guess, it was incredible they could be off by such a wide margin.
>
> Moderator: Where did you see this in the newspaper?
>
> Respondent 2: It was right on the front section, in the first three pages.
>
> Moderator: Did anyone else catch that tree article?
>
> Respondent 2: Yeah, the same thing. We all know about the redwoods. Growing up you learn about them or maybe you went to visit them or something. It just seemed so fascinating that they are so big, so preserved, obviously it catches your eye. If it had been a news magazine, I don't think, it would have been as interesting. I'm sure there will be a lot of information out about it.
>
> Moderator: So you are saying that you like the notion that they are proving the theory wrong.
>
> Respondent 2: Just like R1 said, it raises doubt about other things. When we read things, we tend to believe them. Maybe more so than we ought to.
>
> Respondent 1: Than we probably should.

Frequency of Recalling Science News.

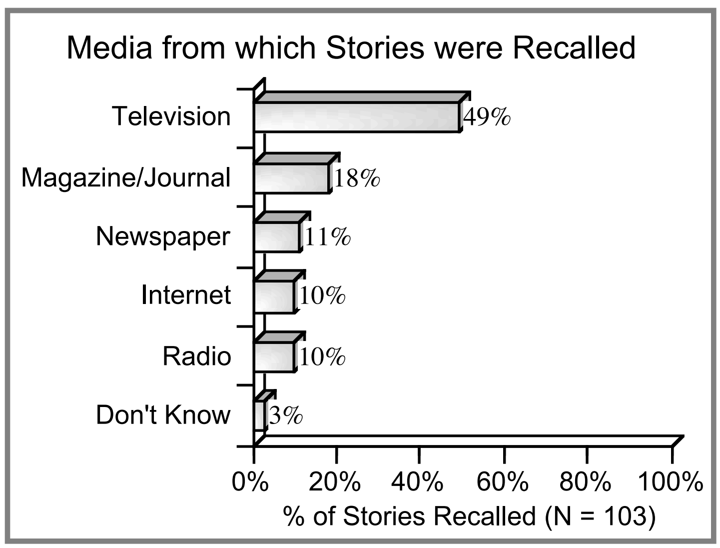
Of the total sample, 69% recalled a recent science news story and 11% more also reported recognizing one of those stories as a recent media report (see chart to right). One-fifth of the sample (20%) could not recall a science story that they had been exposed to recently. Of the total sample, 12% recalled a second science news story and 1% recognized one of those stories as a recent media report.



Those who could recall or recognize a science story had identified significantly more media as providing them with science content compared with those who could not recall a story.[27] Also, those who listened to public radio were more likely to recall a science story than those who did not; 92% of public radio listeners (n = 38) recalled or recognized a story, whereas 75% of non-listeners (n = 90) recalled or recognized a story.[28] However, only two of the 39 stories described by public radio listeners were actually heard on public radio. No other variables were associated with story recall.

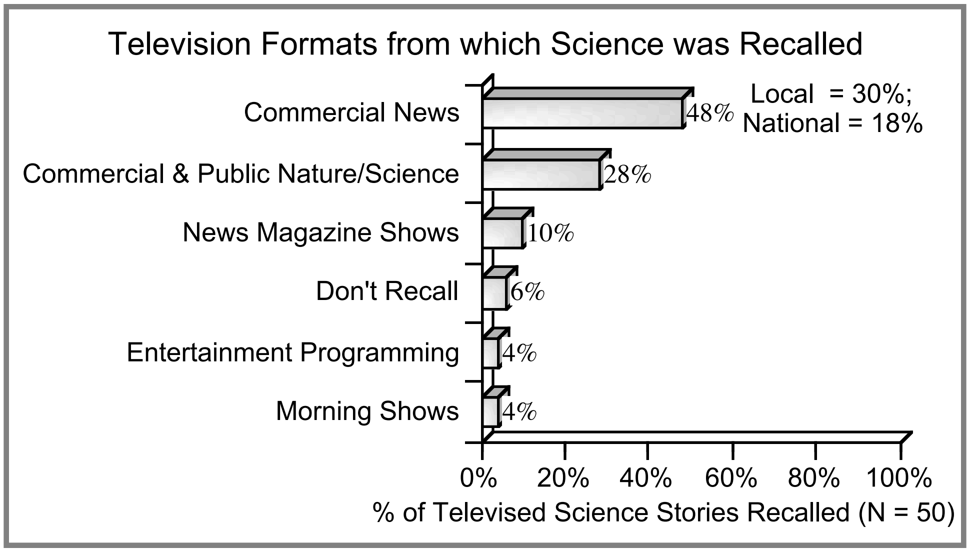
Sources of Science News Stories.

Almost all respondents could name the media source for the science news story they described (see chart at right). Television was overwhelmingly the favorite choice for providing a recent science story, with 49% of the stories originating in a TV broadcast.



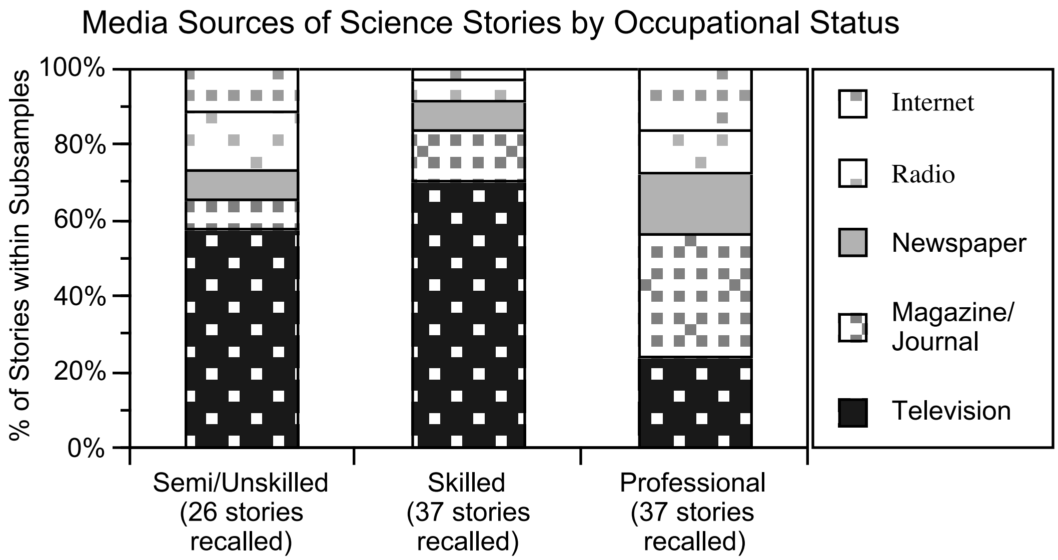
[27] Out of 5 possible media formats, an average of 2.6 media were used regularly by those who recalled stories and 1.96 media by those who could not recall stories; t test = -2.242 with 39df, p = 0.03.
[28] Fisher Exact Test = 0.0486

Within the television medium, viewers most frequently recalled science stories from commercial news broadcasts, locally (30%) and nationally (18%) (see chart below). When referring to local broadcasts, respondents sometimes named a journalist who specialized in health or science reports. Accounting for 28% of the televised stories are science or nature programs typically seen on public stations or cable channels like Discovery, Weather Channel or TLC. Less frequently noted sources were news magazine shows like *60 Minutes*, entertainment programs like *Oprah* and morning shows like *Today.* These results are consistent with the TV formats that respondents earlier said gave them science information (see page 9).



Although television was a major source of "top of the mind" science news stories, the qualitative data also indicate that a sufficiently newsworthy story filters into people's lives through numerous media. In one locale, a petting zoo was the cause of a small e-coli epidemic. Children were infected in September, 2000, although the first news reports did not appear until early November. Area participants who met in mid-December recalled seeing affected children on the local television news, hearing the story on the local commercial newsradio station, reading about it in the daily city newspaper and even searching the Internet for symptoms. Similarly, the national story in December, 2000, about the space shuttle docking with the space station was reported seen on television, read about in the newspaper and on the Internet. And in the same time period, Ritalin overuse was heard about via television's *Oprah*, the Internet and the daily newspaper.

Media source for recalled science stories was independent of all variables except occupational status (see chart below).[29] Most of the stories told by the semi/unskilled workers and the skilled respondents were from television, whereas the sources of the professionals were spread among the five media categories, with magazine/journal accounting for the largest portion (32%).



Science Categories of Recalled Stories.

The 103 science news stories recalled were categorized according to science topics, as seen in Table 2 on the next page. Most participants recalled medical stories (35%), stories of space or the universe (15%) or stories involving the immune system (11%). Category was not independent of gender;[30] for example, only men recalled stories in the categories of nature, information technology and neuroscience whereas women told 69% of the health/medicine stories. The sources given with the example stories in Table 2 demonstrate the range of media from which adults obtain their science information.

[29] Chi-square = 20.55 with 8 df, p = 0.0084 (100 of 103 stories could be classified by media source)
[30] Chi-square = 21.00 with 11 df, p = 0.0333.

Table 2. Science Category + Example Stories (media source)	% of 103 stories
Health & Medicine (69% women) "The enzyme tests that vice-president elect Cheney had. They were supposed to be relatively new in terms of determining whether someone had had a heart attack or not." (Daily Newspaper). "I read about Glucosamine and Chondroitin. I heard it was good for breathing, asthma, and the joints." (Magazine - *Prevention*) "A new treatment where you use an extract of cinnamon and people are getting off of insulin." (Christian Radio) "They've discovered a pill that is supposed to have no side effects and be very effective in treating leukemia." (Local TV news) "We are over-drugging our children and under-analyzing them before putting them on Ritalin." (TV - *Oprah*)	35%
Space Sciences & Universe "Latest of theories of relativity and the origin of energy as we know it . . they found that actually there's a negative energy now." (Public TV - *NOVA*) "The solar panels on the space station." (Rock Radio news break) "There's an exploration spacecraft over Mars and they appear to have found traces of water." (Public Radio) "They put a helmet cam on the guys making the space station and they were explaining it as they were doing it." (National TV news - *CNN News*).	15%
Immune System "Due to studies done over the past three years or so, the drug Aricept seems most effective in people that are early Alzheimer's stage as opposed to those that are having more significant problems." (Trade magazine) "An AIDS vaccine, working with chimps." (TV - *60 Minutes*)	11%
Life on Earth "Paleontologists are studying how the saber-tooth tiger hunted, how it used its teeth to hunt. They actually came up with an experiment where they recreated a skull of a tiger using a mechanical device just to explain how it hunted." (TV -*National Geographic)* " It was an interesting step back in time to where the sea was about 400 feet lower, just out of the Bering Strait. A lot of that was land, so folks out of Asia wandered across and colonized and the story went into great detail about it. (Magazine - *National Geographic*)	8%
Human Impact on Earth "A German shipping company was fined a million dollars for a tanker that ran up on the reef by Elliott Key." (Daily Newspaper) "They shut down the last reactor at Chernobyl, and the reason that struck me was that was such a disaster and that it had potential health implications for all of Europe." (Internet - *AP Newswire*)	6%
Earth and Its Atmosphere "They seem to think now that the ozone layer, the hole in the ozone layer is now getting smaller instead of larger." (TV)	5%
Genetic Technology "They're cloning chickens to lay eggs that contain a cancer fighting drug." (TV) "I read an entire issue of "Newsweek" magazine that was devoted to the Human Genome project." (News Magazine - *Newsweek*)	5%
Nature: Flora & Fauna (only men) "I saw a clip on whales and they were saying how ten years ago they were hearing a certain echoing sound and now they are hearing different vocal sounds." (TV - *Discovery*)	5%
Miscellaneous " They did something on building bridges, tunnels, architecture. The kind of science news I'm interested in is more hard core, more engineering related in-depth shows." (Public TV - *Building Big*)	4%
Information Technology (only men) "The risk of being hit by a network of satellite cell phones." (Internet - *cnn.com*)	3%

Neuroscience (only men) "They showcased two case histories of people that experienced unusual brain trauma, very local brain trauma, where one center of that person's brain was affected and it was the center that controls the recognition of faces. . . " (TV)	3%
Materials Science "They injected a glue right on the tumor, then put the radiation right on it, and killed the tumor." (TV- *Entertainment Tonight* or *Extra*)	2%

Attractive Qualities of Stories.

Sixty-nine respondents were able to identify what was appealing about the presentation of the science news story they recalled. Such responses were coded as shown in Table 3. Also presented are the major media sources associated with each of the top four qualities. The attractive quality of "personal relevance" was not independent of gender;[31] more women than men used the descriptor, mostly to describe stories in the health and medicine category.

Table 3. What Attracted Respondents to Science News Stories (distribution by media for those greater than 10% of sample)	% of 69 stories
Personal Relevance (52% TV; 20% magazine; 12% Internet) Related to occupation; Family/friend has disease/symptoms; Can use information in life	39%
Informative (54% TV; 29% magazines)	35%
Visuals (63% TV; 32% magazines) Charts; Diagrams; Graphs; Illustrations; Photos	28%
Interesting Topic (73% TV)	22%
Emotional	9%
Curiosity	9%
Unique topic Mostly medical topics - conjoined twins; artificial heart; Cheney's enzymes; glue on tumor	7%
Short	7%
Important for health impact	6%
Attractive headline	6%
Local relevance Local hospital; local petting farm with E-coli	4%

Part IIB (below) summarizes quantitative data on respondents' self-assessed knowledge of and interest in ten contemporary research areas and on gender differences thereof.

[31] Fisher Exact Test = 0.0061.

B. What broad areas of contemporary research content have the most potential for attracting the public?

Group participants responded to a list of ten major contemporary research areas in science with some of the major defining questions in each area.

How did participants rate their knowledge of ten science research areas?

- An overall mean rating of 2.0 out of 5 (5 = "very knowledgeable") indicates that respondents felt somewhat uninformed about contemporary science.
- 54% of the sample gave lowest knowledge ratings of "1" or "2" to all ten topics.
- Six topics received a mean rating of 2.0 or above: the immune system; human impact on Earth; the universe; life on Earth; Earth and its atmosphere; and neuroscience.
- Those respondents with higher educational levels rated their knowledge higher in the areas of immune system and neuroscience.
- Men rated their knowledge higher than women in the categories of information technology, materials science and fundamental physics.

How did participants rate their interest in ten science research areas?

- An overall mean rating of 3.5 out of 5 (5 = "very interested") indicates that respondents felt somewhat interested in contemporary science issues.
- 25% of the sample gave highest interest ratings of "4" or "5" to all ten topics.
- Six topics received a mean rating of 3.5 or above: the immune system; human impact on Earth; neuroscience; the universe; genetic technology; and Earth and its atmosphere.
- Women rated their interest significantly higher than men in the categories of immune system and neuroscience, whereas men rated their interest higher in information technology and fundamental physics.

Which of the ten research areas interested participants the most?

- Gender was a significant variable in respondents' choices of two topics that interested them the most.
- The top five topics for women accounted for 95% of their votes and focused on human issues: immune system, neuroscience, human impact on Earth, genetic technology and universe.
- The men were broader as well as different in their choices of favorite categories, with 67% of their votes going for five choices: human impact on Earth, universe, information technology, Earth and its atmosphere, and immune system.
- More women than men preferred the immune system and neuroscience topics, whereas more men than women preferred the topics of Earth and its atmosphere, information technology and materials science.

<u>Procedure</u>. Group participants were presented with a list of ten major contemporary research areas in science with some of the major defining questions in each area (see Table 4 on the next page). Respondents were asked to read the descriptions and indicate for each research area how <u>knowledgeable</u> and how <u>interested</u> they were on a five-point scale, where 5 = very and 1 = not at all. Subsequently, respondents checkmarked two and just two topics out of the ten that interested them the most and discussed why.

The procedure to develop this list began with a review of recent years publications of *Scientific American*, *American Scientist* and *Technology Review* as representative of major science review publications. Also examined were special millennium year issues of "what science will know" in the future. An additional source was the *Science News of the Year* as listed by Science News Online, the Weekly Newsmagazine of Science.[32] These hard print and electronic publications were examined for frequency of topics. An initial list was drafted of major headline areas with large defining research questions within those areas. The questions were to help our lay public understand the parameters of the headlined research area. The goal was to generate a list that represented important issues in contemporary science that might be the basis for review programs. One large omission in the list is that of topics from the NSF Directorate of social, behavioral and economic sciences; this area was not frequently covered in the publications examined and was thus omitted.

The draft was reviewed by individuals representing different science media: television, radio, and museums, as well as by NSF representatives. Their feedback focused on organization, completeness and accuracy. The list was then reorganized to ten major topics, eliminating repetition and overlap; adding issues recommended by at least two reviewers; reducing detail and science jargon so that a less-educated respondent would not feel overwhelmed when reading the list. The revision was reviewed finally by two evaluation colleagues who focused mainly on language and sentence structure for clarity of presentation. The final topics were presented in a randomly determined order to the focus groups (see Table 4 on the next page).

[32] www.sciencenews.org

Table 4. Contemporary Science Research Areas

The universe
How did our universe form? What are the driving forces that make it change over time? What is the meaning of strange phenomena like black holes and gamma bursts? What can we learn about planets, galaxies and possibly universes beyond our own? Is there life elsewhere?

Earth and its atmosphere
How did the planet and atmosphere form and change over time? How do they continue to evolve? What are the dynamics of the inner earth, and how can we predict earthquakes and volcanoes? What processes dictate climate and how can we forecast tornados and weather patterns accurately?

Human impact on Earth
How do human activities influence climatic changes, land habitats and world fisheries? How can changes be monitored and controlled, if not reversed? How will these changes, such as global warming and rainforest destruction and overfishing, impact life on earth? What is the impact of exploding population growth?

Life on Earth
What were the first lifeforms on earth? How does evolutionary change occur? Where and what new species will we discover? Will new fossil finds and genetic analysis revise the history of the human race? What is the origin of languages, farming and complex societies in prehistory?

The immune system
How does the immune system defend the body? What is the nature of and how does one prevent infections like AIDS or malaria? What is the nature of and how does one prevent immune system malfunctions like cancer? Can transplant rejection be eliminated, flu cases cured and human aging postponed with a better understanding of the immune system?

Genetic technology
What will we learn about life using the newly completed catalogue of the genetic instructions that shape a human being? How will gene therapy or vaccines impact disease or disorders? How will genetic knowledge affect drug development or genetic modification of bacteria, animals and plants? What will be the ethical, legal and social impacts of genetic technology?

Information technology
How will information processing and communication continue to speed up and improve? How will the limitations of current computing be overcome by molecular, quantum or biological computers? How will robots or image-recognition technology change medical practice, scientific data collection and military defense? What will be societal impacts of new technologies?

Materials science
What will be the new developments in superconductors, plant plastics, blood substitutes, human tissue, and replacements for toxic materials like lead and asbestos? What will be the impact of controlling the structure of materials at the level of a few atoms or molecules (i .e., nanotechnology), and when will practical applications result?

Neuroscience
How does the human brain work? What processes are involved in learning, thinking, decision-making and consciousness? Can we regenerate brain cells and spinal cells? How does the brain interact with our health?

Fundamental physics
How will the basic forces of physics be unified by one explanatory theory? Will giant accelerator experiments lead to an understanding of matter and antimatter? What will be the next particles discovered or elements made?

Self-assessed Knowledge of Contemporary Research Areas

Respondents rated each of the ten science research areas described in Table 4 on a five-point knowledge scale, where 1 meant "not at all knowledgeable" and 5 meant "very knowledgeable." The topics' mean ratings were 2.4 and lower (see center column in Table 5 below). The overall mean was 2.0, indicating that respondents felt somewhat uninformed about science. Those giving "1" ratings of "not at all" knowledgeable ranged from 20% to 75% across the topics (see righthand column in Table 5). Only 4% of the sample gave "1" ratings to all ten of the topics, but 54% gave "1" or "2" ratings to all ten topics.[33]

Table 5. Self-Assessed Knowledge of Science Research Areas

Research Areas	Mean Rating	% of sample "Not at all" Knowledgeable
1. The immune system	2.42	20%
2. Human impact on Earth	2.41	23%
3. The universe	2.19	22%
4. Life on Earth	2.18	29%
5. Earth and its atmosphere	2.15	27%
6. Neuroscience	2.00	32%
7. Genetic technology	1.91	40%
8. Information technology	1.84	48%
9. Materials science	1.52	62%
10. Fundamental physics	1.39	75%
All areas	2.01	4%

Across all ten areas, men rated their knowledge (mean = 2.2) significantly higher than women (mean = 1.8).[34] Those with a college education or more (mean = 2.2) rated their knowledge significantly higher than those with less education (mean = 1.9).[35]

Knowledge ratings in some individual science areas also showed significant relationships with respondents' gender and education. Table 6 presents significant chi-square statistics

[33] Low assessment of science knowledge is typical of the American public. In the National Science Board's 2000 report of a survey of random 1,882 adults, 17% said they were "well informed" on science topics and 30% said they were "poorly informed." www.nsf.gov/cgi-bin/getpub?nsb001

[34] $t = -3.289$ with 113 df, $p = 0.0013$.

[35] $t = -2.13$ with 96 df, $p = 0.0357$.

and a comparison of subsample percentages providing the lowest knowledge ratings of "1" and " 2."

For the topics of immune system and neuroscience, those with higher educational levels tended to rate their knowledge higher. Gender was influential on respondents' assessment of knowledge for the research areas of information technology, materials science and fundamental physics. In these three categories, men rated their knowledge higher than women (see Table 6 for specifics).

Table 6. Ratings of Knowledge (Research Area x Classification Variable)

Research Areas	**Education** (≤HS; Some College; College grad; Grad school)	**Gender** (Male; Female)
1. Immune system	Ratings of 1 or 2 given by 64% ≤ HS; 67% Some Coll; 58% College; 45% Grad. School $c^2 = 24.06$, df = 12; $p = .02$	
6. Neuroscience	Ratings of 1 or 2 given by 91% ≤ HS; 78% Some Coll 77% College; 52% Grad. School $c^2 = 28.50$, df = 12; $p \leq .005$	
8. Information technology		Ratings of 1 or 2 given by 89% females; 61% males $c^2 = 24.28$, df = 4; $p = 0.0001$
9. Materials science		Ratings of 1 or 2 given by 100% females; 79% males $c^2 = 22.59$, df = 4; $p = 0.0002$
10. Fundamental physics		Ratings of 1 or 2 given by 100% females; 69% males $c^2 = 21.47$, df = 4; p 0.0003

Self-assessed Interest in Contemporary Research Areas

Respondents rated each of the ten science research areas described in Table 4 on a five-point interest scale, where 1 meant "not at all interested" and 5 meant "very interested." The topics' mean ratings were 2.5 and higher (see center column of Table 7 below). The overall mean was 3.5, indicating that respondents felt somewhat interested in contemporary science. Those giving "5" ratings of "very" interested ranged from 13% to 45% across the topics (see righthand column of Table 7). Only 4% of the sample gave "5" ratings to all ten of the topics; 25% gave "4" or "5" ratings to all ten topics.[36] Interest ratings were highly correlated with knowledge ratings at $\underline{r} = 0.44$.

Table 7. Self-Assessed Interest in Science Research Areas

Research Areas	Mean Rating	% of sample "Very" Interested
1. The immune system	4.15	45%
2. Human impact on Earth	3.96	39%
3. Neuroscience	3.90	39%
4. The universe	3.74	34%
5. Genetic technology	3.72	32%
6. Earth and its atmosphere	3.53	25%
7. Life on Earth	3.48	30%
8. Information technology	3.29	22%
9. Materials science	2.82	15%
10. Fundamental physics	2.52	13%
All areas	3.52	4%

[36] A higher assessment of public interest in "science discoveries" was found in the National Science Board's 2000 report of a survey of random 1,882 adults: 56% said they were " interested" or "very interested" in science discoveries and the use of new inventions and technologies www.nsf.gov/cgi-bin/getpub?nsb001. Also a 2000 Gallup survey of 1,003 US adults found that 67% were interested in news about science discoveries www.bayerus.com/msms/index.html. Neither study defined explicit content areas or discoveries.

Interest ratings in some individual science areas also showed significant relationships with respondents' gender. Table 8 presents significant chi-square statistics and a comparison of subsample percentages providing the highest interest ratings of "4" and "5."

Gender was influential in respondents' assessment of interest for four research areas. Women rated their interest higher than men in the immune system and neuroscience, whereas men rated their interest higher in information technology and fundamental physics (see Table 8 for specifics).

Table 8. Ratings of Interest (Research Area x Gender)

Research Areas	**Gender** (Male; Female)
1. Immune system	Ratings of 4 or 5 given by 91% females; 63% males $c^2 = 16.89$, df = 4; $p = 0.002$
3. Neuroscience	Ratings of 4 or 5 given by 77% females; 54% males $c^2 = 12.06$, df = 4; $p = 0.0169$
8. Information technology	Ratings of 4 or 5 given by 35% females; 61% males $c^2 = 9.836$, df = 4; $p = 0.0433$
10. Fundamental physics	Ratings of 4 or 5 given by 12% females; 36% males $c^2 = 15.78$, df = 4; p 0.0033

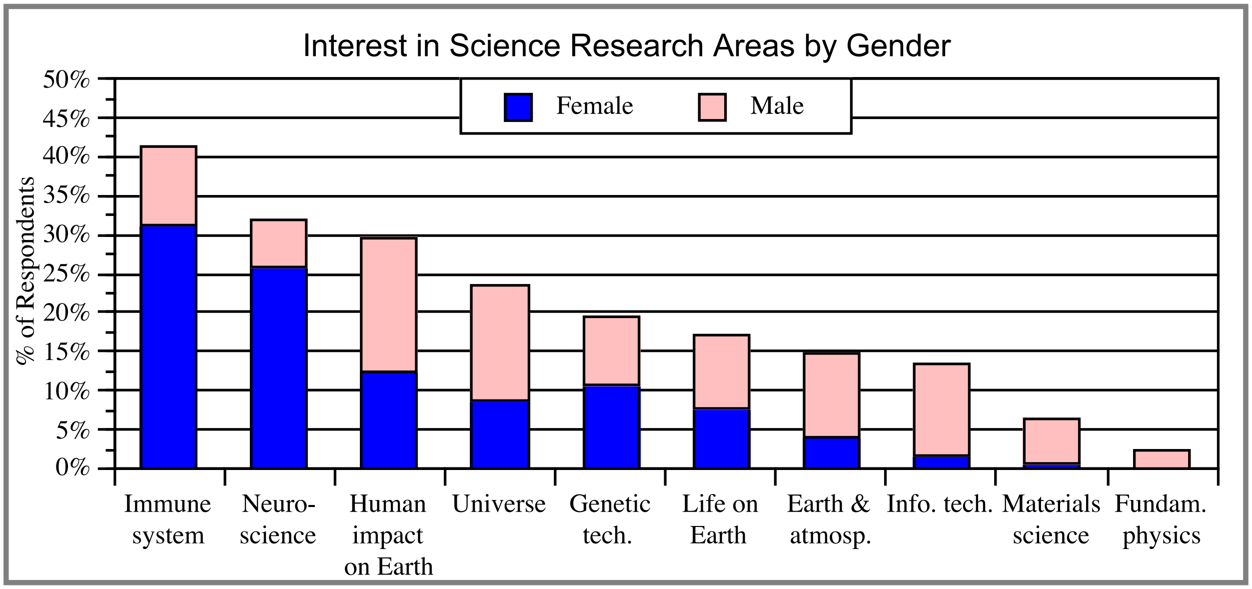
Contemporary Research of Highest Interest

After rating all ten topics as described above, the participants were asked to checkmark two and just two topics out of the ten that interested them the most. Table 9 presents in the center column the percentage of respondents voting for each topic; the column adds up to 200%, reflecting the use of two votes. So, given two votes, 30% or more of the sample chose the immune system, neuroscience and human impact on Earth as topics that interested them the most.

Gender was the only variable related significantly to topic preference. Table 9 presents in the righthand column the significant Fisher Exact Test results (voting x gender) as well as the percentage of females and males voting for each topic. More women than men preferred the immune system and neuroscience topics, whereas more men than women preferred the topics of earth and its atmosphere, information technology and materials science.

Table 9. Distribution of Interest in Science Research Areas

Research Areas	**% choosing topic as most interesting**	**Gender Differences** % voting for topic
1. The immune system	41%	Fisher Exact Test ≤ 0.0001 61% females; 21% males
2. Neuroscience	32%	Fisher Exact Test ≤ 0.0001 50% females; 13% males
3. Human impact on Earth	30%	
4. The universe	23%	
5. Genetic technology	20%	
6. Life on Earth	17%	
7. Earth and its atmosphere	15%	Fisher Exact Test = 0.024 8% females; 23% males
8. Information technology	13%	Fisher Exact Test = 0.0004 3% females; 24% males
9. Materials science	6%	Fisher Exact Test = 0.0291 2% females; 11% males
10. Fundamental physics	2%	



The chart above presents preferred science areas by gender, since gender was the most important variable relating to topic preference. The top five topics for women - immune system, neuroscience, human impact on Earth, genetic technology and universe account for 95% of the women's votes. The women were very consistent and narrow in their choices, focusing mainly on topics that had to do with humans. The top five topics for men - human impact on Earth, universe, information technology, earth and its atmosphere, and immune system account for 67% of the men's votes. The men were broader as well as different in their choices of favorite categories. Women and men were in agreement in three of their top five choices: human impact on Earth, immune system and universe.

Part IIC (below) explores qualitative findings about why participants were interested in the ten varied research areas.

C. Why do the ten broad areas of contemporary research attract the public?

Group participants described why they chose their two "most interesting" research areas among the ten described:

- The major theme across the areas was how relevant the topic was to one's own life - relevance to one's health and functioning; relevance to understanding oneself; relevance to protecting one's environment; relevance to one's work, hobby, or childhood interest; or relevance to simply being human.
- An intellectual interest was a secondary trend across the topics - respondents were "fascinated" or just "interested" in the topics and the associated research questions.

What main reasons explain appeal of individual research areas?

- <u>Immune system</u> - direct personal interest, often because of medical fears about oneself or a family member or fears associated with aging;
- <u>Neuroscience</u> - intellectual "fascination" or "interest";
- <u>Human impact on Earth</u> - concern with saving Earth for future generations or had experienced some local negative environmental impact;
- <u>Universe</u> - fascination with the "big" questions or interest traced back to childhood;
- <u>Genetic technology</u> - intellectual "fascination;" feeling that research would lead to cures; or interest in ethical issues raised;
- <u>Life on Earth</u> - interest in content issues including the origins of life and evolution as well as the histories of societies and languages;
- <u>Earth and its atmosphere</u> - interest in the dynamics and impact of weather;
- <u>Information technology</u> - concern with changes in their lives and others because of technological advances and increased speed of communication and information transfer;
- <u>Materials science</u> - interesting to those whose work involved materials;
- <u>Fundamental physics</u> - interesting to those seeking the "ultimate science."

<u>Procedure</u>. After choosing two of the ten contemporary research areas that interested them the most, respondents discussed WHY they were interested in each of their chosen topics. Responses were sorted by keyword/keyphrase into mutually exclusive categories; however, a respondent's discussion could provide more than one distinct reason for his or her interest in a topic. The following pages summarize the reasons given in discussion of each of the ten topics.

1. Why Interested in the Immune System?

40% Personal Relevance

Two-fifths of those interested in the immune system, exclusively women, used the terms 'personal interest' or 'need to know' in explaining why this topic was most interesting to them. They have a family member or friend who has an immune related disorder and feel that the information is very relevant to them. They say things like "it's information that I can personally use;" "It is of intensely personal interest;" "I have a personal interest in this;" "I need to know about this kind of stuff."

"I have family that have cancer and have known someone that's died of AIDS. To me, it's something that you're interested in how, you know, your body could deteriorate and so quickly; one minute, everything is fine and the next minute, you drop." Female, Skilled worker

15% Prevention information

A group of 15%, mostly women, were interested in prevention information; e.g., "how you can prevent yourself from getting certain diseases."

"I always like to read about things that affect our health and what we can do about it and maybe what we should have done in the past but didn't know about." Female, Semi/Unskilled worker

15% Simply interested

Another group of 15% of those interested in this area were simply curious about the immune system. They had studied biology in college, liked to be informed about the human body, and found it interesting. Again, these were mostly women with a sprinkling of men.

"I studied the immune system. I just think it's interesting - blood, blood work and immunities and body defenses - academically interesting." Female, Professional worker

15% Biological conflict

About 15% of those interested in this area, half men, found the biological conflict "fascinating." They were fascinated with the "battles" and "fighting" going on in the body. This group focused on the process, the mechanism, rather than the end result of the process, that is the disease or disorder.

"I find the adaptation of the microbe fascinating because they're fighting for their lives as well, and what's really fascinating is that we only have two antibiotics left, maybe one, and when that one's breached, we will have no defenses left. The biological warfare is fascinating." Male, Semi/Unskilled worker

7% Work related

A very small portion (7%) of those interested in this topic, all women again, were interested because of their work. They were therapists, nurses or fitness trainers who found this kind of information useful in their occupation.

"I work with geriatric patients. I do a lot of education in my job, and we talk a lot about the immune system. A lot of counseling I do is stress related, which relates to the immune system." Female, Professional worker

2. Why Interested in Neuroscience?

24% Intellectual fascination

One-quarter of those choosing this topic, all women, were intellectually "fascinated." The terms "fascinating" or "amazing" appear in responses in this category:

> "It's fascinating how a human mass like this is basically like a computer but not of a metallic substance. It's neurons and everything else and all of it contains such memory. It's a fascinating piece of matter." Female, Skilled worker

22% Simply interested

One-fifth of those choosing this research area, half men, were simply "interested" in the various aspects of the neuroscience topic. Although this category appears similar to the one above, it is separated out to represent a group with a less intense interest:

> "I think it's a very complex and very interesting science of the human brain that can control the way you feel, the way you would like to feel." Male, Skilled worker

20% Work related

One-fifth of those interested in this topic, all women, were interested because of their work. They were professionals who found this kind of information useful in their occupations, which included children's advocate, clinical therapist, occupational therapist, psychologist and teacher.

> "My interest is in health and health sciences. I work with a lot of brain injured patients, a lot of people who have suffered strokes." Female, Professional worker

15% Personal Relevance

A personal interest was reflected in the reasons of 15%. Mostly women, this group felt the information would be useful to their own functioning.

> "This very much intrigues me. I have a very anal personality, and I have several obsessive-compulsive disorders. I like things to happen in a logical sequence, and it just interests me to figure out how my brain works and why it works this way. Like my house can be a complete mess, but if my couch pillows are perpendicular, everything is fine, life is good. Why?" Female, Semi/Unskilled worker

12% Spinal injuries, Cell regeneration

A small portion (12%) discussed their interest in cell regeneration as part of their reason for choosing neuroscience:

> "I'm impressed with progress when people have spinal injuries and things like that they know they can grow nerves. I think we're going to see progress in that." Male, Skilled worker

12% Learning by young children

Another small group (12%) chose neuroscience because of their interest in how the brain develops and how children, in particular, learn:

> "I'm interested in kids, how they learn, how the brain develops." Female, Professional worker

3. Why Interested in Human impact on Earth?

28% Protecting Earth for future generations

More than one-quarter of those who chose this topic, mostly men, were worried about saving the Earth for future generations, both in the abstract and in the specific, as exemplified by this quote:

> "I'm more concerned about the fisheries and the water system and stuff like that. What's actually gonna happen to them. The fisheries right now are hurting, and we've got to try to figure out the impact on how we can switch over and do a lot better than we are now. I just do a lot of fishing and I want to get my boys into it. . . When my grandkids get old enough, they'll be able to go out and do the fishing thing without having any problems." Male, Skilled worker

21% Experienced local negative environmental impact

One-fifth of those who chose this topic reported personal experiences with negative environmental impacts in Florida canals and reefs, in Massachusetts woods and in Michigan lakes and rivers. There was recognition that humans were influencing the environment locally and concern about it.

> "Back in 1969, all the canals in south Florida were blue. You dare swim in one now." Male, Professional worker.

18% Prevention information

A group of 18% were interested in obtaining information that they could use in their own lives to make a difference and/or were interested in educating the public.

> "I feel like there is something I can do about it in a very small way, so I like to know what I could be doing to make positive changes." Female, Skilled worker

> "I'm interested in finding out ways that we can make the general public aware of how we can protect the environment and how to slow down the process of destroying ourselves." Female, Skilled worker

13% Population growth

A group of 13%, mostly female professionals, focused on the question posed about the impact of exploding population growth.

> "I wonder about how long the earth can sustain itself. We all have an impact, and I wonder how we can minimize the impact and what that would mean? Will we end up like China with rules like one child per family?" Female, Professional worker

10% Simply interested

A small group of 10% were simply curious about all the questions listed under the general category.

> "I'm curious about a lot of these things. Human activities. Global changes. How much? Why? If so, how do we curtail them? Have they really proven global warming? I guess I'm really curious about these things." Male, Professional worker

4. Why Interested in the Universe?

27% Intellectual fascination

Over one-quarter of those interested in the universe as a topic noted a "fascination" with the "big" questions of where we came from and where we're going. Most of these respondents were men.

"The fact of the universe fascinates me. It's like you say, knowing where you come from, where you're going. It fascinates me." Male, Skilled worker

"I think those larger questions of who we are, where we came from, how did it all start are fascinating." Male, Professional worker

27% Personal interest from childhood

Over one-quarter of those choosing this topic described an interest in the universe stemming from childhood.

"I've always been interested. I wanted to be an astronaut when I was a kid. I always liked science fiction." Male, Semi/Unskilled worker

17% Interested in the possibility of life elsewhere

Almost one-fifth (17%) of those interested in the universe topic were most intrigued by the idea that life might exist elsewhere. These respondents were mostly male.

"I'm really interested in knowing whether or not there is life out there. One of my interesting shows I watch is *X-Files*.. It's so different, and I believe there is life out there, so it just really interests me." Female, Skilled worker.

17% Uninformed and want to know more

About 17% claimed ignorance of the universe but chose the topic because they were interested in learning.

"I'm very interested in learning more and know very little about what is listed there. About the only things I know about them is what you see on "Star Trek" or in sci-fi movies." Female, Semi/Unskilled worker

13% Perspective of Size

A small group of respondents (13%) were interested in how the large size of the universe dwarfs our own environment.

"I think in order to keep our perspective, we gotta keep in mind where we are in the balance. How small all of this is compared to what's out there." Male, Semi/Unskilled worker

10% Religious implications

Religious implications were discussed by some respondents concerned with origins of life and the possibility of life elsewhere.

"I also think that it can have some real serious religious implications. I mean, if we ever discovered that there was other intelligence out there, you know, it would just be - it would rock our world and I find that fascinating." Male, Professional worker

5. Why Interested in Genetic Technology?

28% Intellectual fascination

Over one-quarter of those interested in genetic technology described their interest in genetics as "fascinated." Most of these respondents were men.

"The human genome project and the extreme complexity of trying to work all that out is extremely fascinating to me. There is a lot of promise there." Male, Professional worker

28% Focus on the potential of cures

Many women chose this topic as most interesting because of the potential for cures for diseases and disorders.

"I really believe it is the future for all of use. It is an extension of the other health issues. I think that's where it is all going to wind up. The cancer and all that. That's where we are going to find answers." Female, Skilled worker

28% Concern with ethical issues

Mostly women discussed their interest in this topic with respect to the ethical issues associated with the research.

"I am drawn to things that are controversial and cause people to really have to think about the ethical questions. I love a good conflict. So I think it is amazing to get information about topics that we are probably going to have some huge ethical issues around in the next generation. And it is an area that I think there is a huge amount that is going to be done, so it has some spooky implications. I feel uncomfortable having little knowledge about something that is so important. And I think we are probably going to be voting on these things, so they are important to know about." Female, Skilled worker

20% Interest in process and mechanics

One-fifth of those choosing this topic, mostly men, were interested in the process and mechanics of genetics research and therapy.

"They're working on a technology where they're able to extract a gene from your body, a diseased gene, make it a healthy gene, put it back into your body." Male, Skilled worker

6. Why Interested in Life on Earth?

45% Interest in origins of life and evolution

Almost half of those choosing this topic as most interesting mentioned their curiosity about how life began and evolves, even though some of these respondents declared their disbelief in evolutionary theory.

"I'm kind of curious about like who was the first on earth, so I'll watch the Discovery Channel or the *X-Files* or other shows where science is making you go back and think about how things began. Like I'm not sure I believe in it, but I like to see both sides. It's like when there is a new find, I find it interesting to see what scientists think about how life started and how that keeps changing with new discoveries." Female, Semi/Unskilled worker

36% Interest in the human issues: societies and languages

Over one-third of those interested in the topic of life on earth focused on the questions posed about human issues: the "origin of languages, farming and complex societies in prehistory."

"I'm just interested in things like the origins of language, farming. How did those things come about?" Male, Skilled worker

32% Interest in fossil finds

One-third of those choosing this topic noted an interest in fossil finds and their significance.

"I have a lot of interest in fossils and the formation and changes of people and animals over time, and how you can think that they have it all down and then they dig up something. Like before where they thought they had determined where birds had begun flying and they narrowed it down to this particular date and didn't think that there was any birds that flew before that date. And then they discovered another fossil that actually put it prior to that, so they had to reconstruct what they thought." Female, Professional worker

27% Personal interest from childhood

Over one-quarter of those choosing this topic described an interest in the issues of life on earth stemming from school or childhood experiences.

"I love all things, animals, and missing link stuff. Maybe we did come from apes. In school and stuff, I was a dinosaur junkie." Male, Semi/Unskilled worker

7. Why Interested in Earth and its Atmosphere?

37% Fascinated by weather and its impact

Over one-third of those choosing this topic as most interesting described themselves as "fascinated" by weather, particularly dangerous weather, and its impact.

> "I love tornadoes. How they can just pop up and then disappear within seconds. They aren't sure why or how. It's just fascinating." Male, Semi/Unskilled worker

16% Protecting Earth for future generations

A small portion of those interested in the topic of Earth and its atmosphere focused on the issue of taking care of the planet. This group was all men.

> "I picked this one because I think that before we get out and explore all the universe, we have to take care of our Earth and the atmosphere, before going somewhere else and worrying about putting man somewhere else. So, taking care of the planet, that's what interests me." Male, Skilled

16% Interest in process and mechanics

Another small group, all men again, voiced curiosity about how the physical changes occur.

> "I guess the history of the planet and the fact that it is so old, and what has caused what continents to be here and in what form. Then, I think the idea of volcanoes being molten, in the center of it all. So, mainly the earth, its structure and history, the changes that it's gone through since the ice age and all.. . . The History Channel has had some shows on it recently about asteroids in Russia and they have caused physical changes in the earth. To me, that is more interesting than going and digging up bones."

8. Why Interested in Information Technology?

41% Personal Relevance - Effect on life of advances in technology

Two-fifths of those choosing this topic as most appealing were interested because of the impact of technological changes on their own lives and others. Most of these respondents were men.

> "To see how things will evolve in that area and how it will change life. It's a little scary to me.." Male, Professional worker

35% Speed of communication and information transfer

One-third of those interested in information technology discussed their amazement at how communication has changed and sped up and how much information is so readily available with advances in information technology.

> "I just think it's interesting how they are coming out with fiber optics stuff. . . you can pick up a phone and talk to someone halfway across the world or wherever. Everything is so quick compared to before it would take months to get a letter across the country. Or the Internet, how you can get that much information in such a little while." Male, Semi/Unskilled worker

18% Interested for one's kids' welfare

A small group of men chose this topic because they felt they should keep informed on behalf of their children - either for protecting them or for teaching them what will be in their future.

> "It's just amazing to me that they keep coming up with more stuff. And I want my kids to know about this, because it is going to be just common knowledge in ten years that you know this stuff. Stuff that is really complex now to us will be common knowledge to our kids, and I want to have a leg up to be able to teach my children." Male, Professional worker

9. Why Interested in Materials Science?

63% Work related

Men chose this topic mostly because the content was interesting to them because of their profession or actually relevant to their profession - be it architect, carpenter, chemist, mechanic or salvage worker.

> "I'm a mechanic and I like to study. Energy, steam, electricity really intrigue me and wind power, you know, different machines like that. I just think it's fascinating the study of atoms and the molecules, how they're coming up with new products, making new products, and that opens the door to other developments. Also, as they go out in space and work on these things, things in the atmosphere they can test out, it's just furthering science." Male, Semi/Unskilled worker

10. Why Interested in Fundamental Physics?

100% Intellectual fascination

The three men choosing this topic as most interesting to them described their interest as simply thirst for knowledge.

> "It is the ultimate science. I was humbled when I tried to read Stephen Hawkins book three times. I would reread paragraphs over and over again and still not completely understand it. Physics is in a lot of way the ultimate science." Male, Skilled worker

PART III: MEDIA FORMATS AND FEATURES

Part III summarizes presentation formats and features that respondent groups feel would attract their interest and facilitate communication of science updates.

What formats and features presenting up-to-date findings within broad science areas have the potential to capture the eyes and ears of the public on a regular basis?

To reach them most successfully, respondent groups would tell the science community to:

- Make science presentations more readily available;
- Present at a level that they can understand;
- Use visuals to attract and aid understanding;
- Make the science relevant and personal to their lives:
- Reach them though their children;
- Continue or add a science supplement to newspapers;
- Take care in choosing a host and defining that role;
- Market widely, creatively and often;
- Establish credibility;
- Think outside the box.

Procedure. The last part of the focus group sessions was used to discuss science media formats that participants thought would be effective and appealing to people like them. The focus in this section was on format and feature issues as opposed to media habits or science content. The goal was to brainstorm on how the science community could reach out, through the various media, to let them know what was going on in contemporary research. The key discussion direction was "talk about the best way to reach you personally with reviews of science news." An alternative phrasing was: "We realize that it's hard sometimes to be motivated to keep up with science, but what would capture your attention on a regular basis?" A set of general and more specific probe questions were used to identify media characteristics that were important to effectively updating the public about science news. The group discussions ranged broadly so the reporting here employed qualitative content analysis to describe main themes and the range and diversity of perceptions and suggestions encompassed by the themes.

Make science presentations more readily available

Thirteen of the eighteen focus groups were concerned with time management, schedules and availability of media programming. Unless they were particularly interested in pursuing a science topic, respondents pointed out how their busy schedules made it difficult for the science community to reach them easily. Group members brainstormed a number of solutions:

- Short radio/TV/magazine news "blurbs" or "commercials" are easier to catch. Can go to Internet, newspaper for in-depth information;
- Daily science news reports integrated into local and national news programs;
- Schedule longer format television and radio at convenient times (of course, what was convenient for one respondent was inconvenient for another);
- To permit self-scheduling, provide video rentals or free library videos;
- Increase overall amount of programming available;
- Establish a dedicated science channel;
- Establish "science" as a main category button in server home pages (e.g., AOL, MSN);
- Provide Internet links within radio/TV/print stories for in-depth follow-up.

The Internet was discussed as a mechanism to allow personalization of science news and in-depth pursuit of science topics with maximum convenience; however, credibility was an issue with this medium; for example:

"I like enough depth in the facts to stir the interest in me so that I ask if this is something I want to pursue. And then give me the tools to go on and look further. . . . here is the website." Male, Semi/Unskilled worker

"You hear a little blurb and then you go to the Internet and investigate further." Female, Semi/Unskilled worker

"With the Internet, it is totally up to me. I'll usually hear stuff and dig deeper to get what I need and then get out. I go with a specific purpose, so I'm like a guy shopping - get in and get out." Male, Semi/Unskilled worker

"I check out CNN.com every day, and they have a section that is on science or space and science. I don't go looking for science, but a lot of times a headline will catch my eye, and I'll end up reading that story." Male, Professional worker

"What you are seeing about the topic on the Internet is really nice because you can pick and choose how much information and what level of detail. I think I'm somewhat skeptical about the Internet though because there's no filter, no screen on the quality of the information you have there so anyone can put anything out there. There's no kind of double check with it other than going to trusted sites." Female, Professional worker

Present at a level that the public can understand

Twelve of the eighteen groups felt that a critically important feature was the technical level of the content. Respondents wanted a presentation, in any medium, to speak to the audience in lay terms and define terminology and concepts used. There was clearly a feeling that science, even complicated science, could and should be made understandable for the lay public.

"No matter how complicated the issue, I expect someone working within that area to be able to break it down into very simple terms and explain it to me. . . I expect a specialist and an expert to be able to explain what they do to the general population. If you're talking over my head, I'm not going to tune into that." Male, Skilled worker

"The thing that turns me off sometimes is that people make it seem so like it's more difficult than it really is. I'm not saying you don't have to dumb it down, but there's a way to present it to make it seem like the person that's actually is doing it is not an absolute genius, cause I know science and there is a way to present it in a way that the average person can get." Male, Professional worker

Use visuals to attract the public and aid understanding

Another critical feature brought up by eleven groups and related to all visual media was the well-thought out use of visuals to attract and communicate. Visuals discussed included graphics; illustrations; charts; animations; computer graphics; timelines; and maps. Respondents wanted eye-catching visuals that supported the message, that didn't just "dazzle" or "distract."

"I want to see graphs and charts and pictures, visual things that make sense to me. Instead of sitting there and trying to read something about a cell, I want to see what that cell they are talking about looks like. . . . I learn by visual things." Male, Skilled worker

"I go to the National Geographic website or the Jet Propulsion Lab site-they're both known for fantastic pictures." Male, Professional worker

"I'm attracted by the visual detail they can give you on TV, the 3-dimensional detail. I watch "Trauma in the ER," and they can get the cameras into all these places you can't see otherwise, and it's so cool." Female, Professional worker

Make the science relevant and personal to the audience

A theme common to the discussions of eleven groups was a need for the science presentation in any media to have some relevance to the audience's lives. This theme was most often noted by women respondents who felt more attracted to and more interested in stories to which they could connect personally. For example,

"It has to apply to something I'm doing in my life." Female, Professional worker

"I think that if you can make it like a real life story. . . . that's more interesting than just giving the information. Involving people." Female, Skilled worker

"Like the space station, where are they going with that? What's it going to help and stuff like that. I'm interested if I can see it's going to help mankind in the long run." Male, Skilled worker

"And they have to show the personal application in all of this. So, this is the discovery that has been made, this is what is going on, this is how it is going to affect your life." Male, Semi/Unskilled worker

Some suggested that an audience member should be able to personalize or apply the information; some needed to know how the science would impact their life; others felt that presentations should involve human stories. Local TV and radio news health reports were noted as typically presenting relevant and interesting science information.

Reach the public through their children

Eleven groups turned the focus toward their children, presenting two main ideas:
1) get kids interested in science early and maintain their interest over years; and
2) present in ways that will encourage parents to interact with their kids.

Respondents suggested that successfully encouraging science as an interest early in life would carry over to lifelong learning as an adult. Parents reported that they learned along with their children by watching television shows like *Bill Nye* and *Popular Mechanics for Kids*. Additionally, they learned from informal materials their children brought home from school: *Body Shop*, *Weekly Reader*, *World Magazine*:

"Not only does the information get out there through the kids, but it gets you talking about it with your kids." Male, Skilled worker

"There's a lot of things that I'm not interested in, but if my kid's interested in it, I'm gonna go along with it. I'd do research and stuff with him and then I'd get the information too." Male, Semi/Unskilled worker.

Continue or add a science supplement to newspapers

Newspaper science sections or supplements were discussed in ten of the eighteen groups. Those from Oregon, Massachusetts and Florida were pleased with science supplements in their local newspaper; a few mentioned the *New York Times* science supplement as a model ("I read the *NY Times* at another job which I loved. I wish the *Philadelphia Inquirer* had that kind of a science section with pictures."). One teacher reported saving newspaper supplements for classroom reference.

The desirable features about a newspaper science section were

- convenience ("you can read it when you want to;" "you can go back to it . . take it in pieces a little at a time;" "science section is streamlined; it's all right there… not wade through extra stuff.");
- credibility ("they're going to be a bit more careful with the facts");
- in-depth information ("so that you know 'why' instead of 'it is' ");
- variety ("broad spectrum of topics");
- visuals ("if there's something visual for me to see with words, I'm good.");
- series of related articles ("first time, it's what the breakthrough was and then the next day or week is why it's important to you");
- relatively inexpensive compared with cable channels that carry science;
- quick scanning via grabbing headlines, color ink, visuals.

Take care in choosing a host and defining that role

Seven groups discussed the characteristics of a good host of a radio or television science show. Most agreed that any host needed to be interesting and credible. A few recommended a host who stood in for the audience and asked questions on their behalf:

> "You should have some big media person to support it. . . . It should be someone who could hold my interest, like Oprah Winfrey or someone who I would tune into. Oprah would make it interesting to me and show what the topic means to the average person." Female Skilled worker
>
> "Paul Harvey - He gives a story and is really good at what he does. His style is interesting . . I think the way he talks, his voice, the way he presents things. . . He has credibility." Three male Semi/Unskilled workers
>
> "On CNBC when they have the presidents of companies, many times it's very technical but the host is like we are and he asks questions to bring out information." Male, Skilled

Some groups pushed for the inclusion of real scientists as the most credible source to tell their own story ("even if on Oprah") but advised against "a Carl Sagan who has a problem talking on my level."

A few groups suggested people with "sufficient credibility in terms of being an intelligent person but also down to earth about conveying information" like Bill Nye or *Science Friday*'s Ira Flatow.

One group felt that celebrities are not the way to go because they have no credibility in the science arena: "Julia Roberts - what does she have to offer, what's her hook in there other than the fact that she's Julia Roberts?"

Market widely, creatively and often

Although eliciting a marketing discussion was not intended by the interview questions, seven focus groups discussed the marketing of the science news products. The main concern was that as audience members they felt that they did not seek out science news in any regular manner. They needed to be reminded in different ways where to find such programs or information:

> "If you don't know about it and it's not publicized, you're not going to tune in unless you happen to be flipping through TV or radio stations." Female, Skilled worker
>
> "I think for me it helps to be exposed to it by accident, so I can then seek it out on purpose. Like if they get me during my commute time on a radio station I'm listening to . . . and they did a short little thing and then told me it's going to be on this show on television. That would be good cause otherwise I might just channel surf right past it, if something doesn't get my interest. Or they could say it's going to be in this magazine this month, and if it is of interest to me, I'll go and read that." Female, Skilled worker
>
> "Like when you hear the commercials about what's going on in the news, it's like, I mean, it just catches your eye when they say something. Certain topics. Today at 5. And you're just stuck on it. And I'll watch it because I want to see what's going on. . . . Why not advertise the stuff that's good for you." Male, Semi/Unskilled worker

The following marketing ideas were suggested and discussed by more than one group:

- Cross-media advertising: have ads for public television in the cable television market; ads for public radio in the television market, and so forth.
- Promote the NSF "brand."
- Advertising by names to attract: Bill Nye; Oprah.
- Billboards along a regular commuting route.
- Airplane banners over beaches, football games to reach large and diverse groups.
- Internet banners but not e-mail spam notification, unless someone has indicated an interest in a specific topic, as in signing up for specific subjects.
- Set up Internet source to identify past, present and future media programs on topics;
- Establish a consistent science time and advertise the time and subjects.

Establish credibility

Five groups discussed briefly the credibility of information, concern about where the information comes from, sensationalism of information, and particularly the uncertainty of Internet credibility and accuracy. One group of skilled workers felt that NSF "has a great reputation and a name that just says respect and they should probably be aggressive in using that name." On the other hand, as a male professional declared: "The source can be the most reputable source in the world, but if I'm not interested, it doesn't matter."

Think outside the box

Groups suggested a variety of ideas for reaching them with science updates that went beyond the major media purposely discussed in the sessions. These outside-the-box concepts included:

- <u>Newsletters</u>. Two groups of professionals mentioned receiving science information via health newsletters (*Harvard Health, Mayo Clinic, Tufts Medical, Nutrition Action Health Letter)* that are written for the "knowledgeable consumer."

- <u>Advocacy literature</u>. Another group of professionals noted that they read literature from Planned Parenthood and environmental advocacy groups whose work deals with science peripherally.

- Free publications distributed by mail. Two groups (skilled and semi-skilled) brainstormed independently about the idea of a free mailed publication that would be attractively and professionally presented in lay language with glossy pictures, each on different topics, but packaged not to say "science."

- Conventions/Amusement parks. A group of skilled workers discussed reaching them at venues where the public spends a good deal of unfilled time:

  "Maybe a [convention booth]. The average person goes to those kinds of things. I think that's optimum time to have booths with all kinds of stuff to take a look at. There's just a lot to time then. You're milling about. Female, Skilled worker

  "Amusement parks. There seems to be a lot of opportunities when people are sitting still or waiting in line. You have their attention; there is nothing else to do but count the tiles." Male, Skilled worker

- Presentations by video or real scientists in the workplace/community centers.

  "They could have scientists go into the workplace to present whatever new data they have. I just think that would be a creative way. That's people in action." Female, Professional worker